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New Research
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ORIGIN OF CANCER.

[THE two communications which follow mark an event in the history of medicine. They form a detailed description of a prolonged and intensive research into the origin of malignant new growths, and they may present a solution of the central problem of cancer.]

THE ÆTIOLOGY OF MALIGNANT NEW GROWTHS.

BY W. E. GYE, M.D. EDIN.

(*From the Medical Research Council's Field Laboratories, Mill Hill, N.W.*)

INTRODUCTION.

IN 1911 Peyton Rous [1] described a sarcoma of the fowl which differs from mammalian tumours in one very important way—namely, that it can be transferred from chicken to chicken by inoculating dead cells, killed by drying or with 50 per cent. glycerol, or by means of a cell-free Berkefeld filtrate. The mammalian tumours, with the possible exception of a lymphosarcoma of dogs,* have so far been transferred only by inoculating living cells. This chicken tumour—No. I. in the series examined by Rous—is a spindle-celled sarcoma which metastasises freely and generally kills the host within 28 days. The malignancy of the tumour has increased with passage. It cannot be transferred to mammals or to any other species of birds than the hen, either by inoculating living cells or filtrates. Its specificity at first was exceptionally strict; successful transplantations of the tumour could be obtained only in blood relations of the bird—a Plymouth Rock—in which the original tumour occurred. The tumour now grows freely in other varieties of fowls, but the Plymouth Rock is still by far the most suitable variety of bird for experimental study.

A second filterable tumour of the hen was described by Rous [2] in 1912 (Tumour VII.). This tumour is an osteochondrosarcoma. The primary growth was benign, but it proved to be transplantable and with repeated passage became malignant. It differs from tumour No. I. not only in its histology, but also in its general behaviour, rate of growth, site of metastatic deposits, &c. It can be transferred with dead cells or with filtrates.

The third of these filterable tumours—No. XVIII.—was described by Rous in 1914.[3] It is a spindle-celled sarcoma with blood sinuses into which growth occurs. The tumour may be propagated with living cells, or with Berkefeld filtrates, but not by means of the dried tumour.[4]

There are, then, three well-described filterable tumours—all sarcomata and all growths of hens—among many thousands of animal tumours which have been transplanted and studied. It is very improbable that every neoplasm which has been described has been tested thoroughly as to its filterability, and it is therefore possible that one or more filterable tumours have been overlooked. But the general statement may be made: First, that no mammalian tumour has been propagated by cell-free filtrates; secondly, that a large number have been tested with entirely negative results; and thirdly, that if filterable mammalian tumours occur they are exceptions to the general rule. Thus the filterable chicken sarcomata differ, apparently, fundamentally from other tumours. This difference has led to expressions of doubt as to their being true new growths. It is unnecessary to discuss this point, as the work to be described will show, but it must nevertheless be pointed out that Rous studied the filterable tumours most carefully and showed clearly that they answer every valid test which has been put forward as a criterion of new growths. Indeed, no set of tumours has been more thoroughly studied from this point of view. In my judgment the classical papers published by Rous between 1911 and 1916 settled this point conclusively.

The problem which remained when Rous concluded his work on these tumours was the determination of the nature of the filterable agent. Rous and his collaborators brought forward strong evidence in favour of its being a filterable virus—a living but extremely small microbe. Thus the agent is destroyed by exposure to a temperature of 55° C. for 15 minutes; by chloroform and toluene; by phenol in concentrations as low as 0·5 per cent., and by other antiseptics; and the tumour may be kept immersed in glycerine and it still retains its infectivity. In spite of this evidence Rous used the term "agent" rather than "virus," since the final proof that the agent is animate its cultivation outside the body was missing.

The work which is to be described in this paper began with the study of chicken sarcoma No. I. Before plunging into details of this work a few words on the parasitic hypothesis of the origin of tumours may not be out of place.

The "parasitic hypothesis" of cancer may be stated briefly as follows: Malignant new growths constitute a specific disease and have as their essential cause a specific parasite. To some advocates the parasite is a microbe—e.g., the *Micrococcus neoformans* of Doyen; to others a protozoon; to others again, it is a new form of organism which is capable of existing as "unorganised plasm," as a filterable virus, in coccal or bacillary forms or as a fungus.

The opponents of the parasitic hypothesis—and they are chiefly those who have devoted themselves to cancer research—have no difficulty in refuting the theory in the form in which it has been presented. In the first place there has been no agreement amongst the advocates as to which of the many organisms brought forward as the "cause" of cancer is the true one, and in the second place it has never been possible to reproduce a tumour with a culture of any one of the organisms. Further, when all the definite knowledge we possess on malignant disease is arranged in due order an impressive case can be made out against the general conception that malignant disease has an extrinsic specific cause. The evidence, however, is largely negative, and is really only destructive of the view that tumours are the pathological consequence of the simple conjunction of host and parasite.

The Rous group of filterable tumours has been an embarrassment to both sides. Those who oppose the parasitic hypothesis have been content either to regard these tumours as entirely exceptional—a view that by implication rejects the concept of new growths as a homogeneous, specific disease and places them as a consequence amongst the inflammations—or to deny that the tumours are true new growths. Those who favour the parasitic hypothesis have inclined to ignore the Rous tumours for different reasons; these tumours make the theory too complicated altogether.

One of the outstanding features of new growths is their specificity. A tumour of the mouse, transplanted in fragments of living cells, will not grow in the rat or vice versa. The species specificity is very strict.

* During the year 1924 I collaborated with the late Dr. B. R. G. Russell in the study of this tumour. The work has been continued in conjunction with Dr. A. M. Begg, and the results will be given in another paper.

It may be argued that this is probably an example of general cellular specificity and is therefore not a particular property of tumour cells. And the argument is probably sound. But cell-free filtrates of the chicken sarcomata are just as strictly specific; they are incapable of producing a tumour in any bird save the hen, and much less in a mammal. Moreover, the filtrate from each tumour reproduces only a tumour of the same structure and general behaviour as that from which it is derived. The specificity, in other words, applies not only to the species but even to tissues. If we accept the conclusion that these tumours are caused by living viruses and argue—justifiably—therefrom that other tumours have similar causes, we are inevitably driven, in the present state of knowledge, to the conclusion that for every species of animal there is at least one group of viruses and for every tissue a particular virus. We are thus led by the logical application of undisputed facts to an apparently absurd position. It does not require a penetrating insight into pathological problems to see that an essential fact is missing and that its discovery may be the key to the general problem of tumours.

This strict specificity, to which is probably related the conspicuous and unique cellular phenomena which are so attractive to pathologists, forms the chief obstacle to all attempts to connect ætiologically the great variety of tumours of so many species of animals with one external agent or class of agent. The complete failure to provide a unifying conception of the disease has led cancer specialists to look upon the malignant transformation of a cell as a physiological reaction—or a perversion of a physiological reaction—to long-continued irritation. In other words, the disease is regarded as a particular problem in cell physiology, and however clearly external agents may be demonstrated as factors in the chain of causation of tumours their influence is considered to be entirely subsidiary to internal cellular capacities, and particularly to those which relate to cell division. In the final analysis of the pathology of tumours all this may turn out to be true, but as relatively little is known in this branch of physiology it is premature to indulge in speculation.

I have no desire in the present preliminary publication to discuss the very numerous theories, some of which are merely fantastic, which have been advanced to explain the origin of tumours. It is sufficient to draw attention to this conflict of opinion on the parasitic hypothesis. The work which I now report, and which has been carried on during the last two years, provides, I think, the reconciliation of the two views.

TECHNICAL NOTES.

1. *Filtration.*—An exaggerated importance has been attached to the filterability of a virus. This is reflected in the common use of the term "filterable virus" as a description of the whole class of very small organisms. The objections to the term come from two sides: first, the relatively gross spirochætes pass through bacterial filters readily, and cannot on any grounds be classed with the very small organisms which are invisible, or which, at least, cannot be resolved with the best microscopes in common use; and, secondly, for various reasons, some undoubted viruses are not filterable under the conditions in which they occur. The virus of vaccinia, for example, as it occurs in calf lymph is not filterable; also, the virus of herpetic encephalitis as it occurs in the brain tissue of rabbits is held back by filter candles. Filterability is determined by a number of factors, one of the most important being the properties of the fluid in which the virus is suspended. This is shown very easily with the Rous chicken sarcoma No. 1. If the disintegrated tumour be insufficiently diluted, or if the diluent employed be distilled water, the filtration is difficult and the filtrate is generally non-infective.

The best method of obtaining an infective filtrate is as follows. Healthy tumour tissue is selected and is minced with sharp scissors; the mince is then rubbed with sterile sand in a Wedgewood mortar in order to break up the cells. This is done very thoroughly. Saline or Ringer's fluid is then added to the mass in the proportion of 100 c.cm. to about 1 g. of tumour. After mixing thoroughly the muddy suspension is filtered under gravity through layers of paper pulp and sand, arranged in a long tube-filter, in order to remove sand and remnants of tissue. The filtrate thus obtained—the "sand filtrate"—is usually a faintly yellow transparent fluid, which passes, under moderate pressure, through a Chamberland L_2 or a Mandler candle with ease. The final "candle filtrate" when inoculated into a chicken in a dose of 1 c.cm. causes the formation of a tumour which is palpable in 14 days and almost always kills the chicken within 28 days. Rous showed that the addition of kieselguhr promotes the development of the new growth. In all the experiments described later a trace of silica has been added to the inocula.

2. *Media.*—In the course of this work a large variety of media has been prepared and tested. The formula of one only, that which has proved most satisfactory, will be given. The basis of the medium is Hartley's broth[5] to which is added 0·2 per cent. KCl. The broth is tubed in 5 c.cm. lots and is sterilised by steaming—never in the autoclave. To each tube of 5 c.cm. is added 1 c.cm. of fresh rabbit serum, after which the tubes are incubated at 37° C. for two days in order to test sterility. When sugars are required the sugar is added to the broth in bulk to give a concentration of 0·5 to 1 per cent.

3. *Aseptic Excision of Tumours.*—Bacteriological technique which involves the use of fresh animal tissue is complicated by the occurrence, especially after prolonged incubation, of contaminations. With chicken tumours the common contaminant is a white staphylococcus; with mouse tumours a Gram-negative bacillus; with rat material a Gram-negative bacillus sometimes occurs and about as often a streptococcus which under anaerobic conditions is very small, but which on solid media, incubated aerobically, assumes a larger size. When contaminations occur attempts to produce a tumour fail; in mice and in rats abscesses often follow the inoculation of material which is slightly infected.

When tubes have been incubated anaerobically it is not always immediately evident that a tube is contaminated; turbidity is not by any means constant. A state of affairs is attained which might be called "concealed contamination," the contamination being revealed only by means of subcultures, aerobic and anaerobic, in broth and on agar.

The following technique has been followed in order to reduce these contaminations to a minimum. The tumour-bearing animal is killed with chloroform or coal-gas and the carcass is then soaked in warm 2 per cent. lysol for five minutes. The subsequent procedures are carried out in a sterile room. The animal is pinned out on a sterile cork slab and the skin reflected so as to expose the tumour, the cutting of the skin and necessary dissection being performed by means of a cautery. After searing the surface, pieces of tumour are excised by means of a dry sterile knife and are dropped into tubes of medium. Unless such strict precautions are taken contaminations occur with disheartening regularity.

EXPERIMENTAL STUDY OF ROUS CHICKEN SARCOMA NO. 1.

It has already been remarked that the injection of 1 c.cm. of a Chamberland L_2 candle filtrate is followed by the formation of a tumour which appears in a fortnight and kills within a month. When the infectivity of such a filtrate is tested with doses of varying size it is shown that a proportionality between size of dose and time of appearance of tumour exists. This is well shown in the following protocol.

Experiment June 20th, 1923.—Chickens were inoculated with L_4 filtrate, all into the pectoral muscle, in quantities indicated in Chart 1. This experiment, modified in various ways, has

CHART 1.

20.6.23. CHICK.	INOCULUM	DAY 7TH	14TH	21ST	28TH	35TH
5	1cc L_2 FILTRATE.	—			† 22ND DAY.	
6	0·5cc L_2 FILTRATE + 0·5cc SALINE.	—				† 35TH DAY.
7	0·25cc L_2 FILTRATE +0·75cc SALINE.	—	—			
8	0·1cc L_2 FILTRATE + 0·9cc SALINE.	—	—	—	—	—
9	0·01cc L_2 FILTRATE + 0·99cc SALINE.	—	—	—	—	—

In the second column of this chart, Chick 8, for 0·95 read 0·90.

been repeated over and over again and the result is constant with filtrates through close candles. The interpretation of the result is not possible without a count of the number of organisms per c.cm. in the infective fluid. Superficially it appears to support the view that the infective "agent" is a chemical substance, since proportionality, in such narrow limits, between dose and effect is not characteristic of living microbes.

INFECTIVITY OF "PRIMARY CULTURES."

A primary culture—a term of convenience—is obtained by placing a fragment of tumour in a tube of medium. The infectivity of the supernatant fluid is retained for a variable length of time depending upon the medium employed and the method of incubation. Retention of infectivity is favoured by anaerobiosis; the more completely oxygen is removed the longer the fluid remains infective. Similarly, the addition of rabbit serum to the broth helps to preserve infectivity. The findings may be summarised as follows:—

(1) When a piece of tumour—roughly 0·5 g. in weight—is dropped into 5 c.cm. of broth and the tube is incubated aerobically at 37° C., the supernatant fluid may remain infective in doses of 1 c.cm. for as long as two days. If the tube is incubated anaerobically the infectivity remains as long as four days, particularly if, before incubation, the air dissolved in the medium or "entangled" in the piece of tumour be removed by means of a Geryk pump.

(2) When the medium contains rabbit serum—5 c.cm. of KCl broth to which has been added 1 c.cm. of sterile serum—infectivity is retained after three days' incubation aerobically. If the aerobiosis be increased by using an Erlenmeyer flask instead of a test-tube infectivity is lost sooner. If a piece of tumour is placed in serum broth and the culture incubated anaerobically the supernatant fluid remains infective often for as long as seven days.

(3) When glucose, maltose, or lævulose are added to the medium an acid reaction occurs, the pH rising often as high as 4·0 to 4·5. With mannite, sucrose, galactose, lactose, dulcite, and salicin fermentation does not occur. The addition of a fermentable sugar tends to increase the time during which infectivity is retained, provided the acidity produced is not too great.

This summary of results of experiments with primary cultures is illustrated by the protocols below, but it must be noted that the size of the piece of tumour added to the medium is of primary importance. If a large mass of tumour—e.g., 2 g.—be added and the culture be incubated aerobically, then it is often possible to produce a tumour with the clear supernatant fluid after as long as seven days' incubation at 37° C. The general impression derived from a long experience of such cultures is that an "agent" diffuses from the tumour tissue and that it disappears slowly in the presence of rabbit serum and under anaerobic conditions, and more rapidly in the presence of oxygen and absence of serum. The larger the piece of tumour the greater the quantity of "agent" to diffuse, and consequently the longer the infectivity is retained.

Experiment Nov. 6th, 1923.—Chicken 44 was inoculated in the right pectoral muscle with 1 c.cm. of a culture made by adding a fragment of tumour (about 0·5 g.) to 5 c.cm. of glucose broth, the tube being incubated aerobically for

CHART 2.

6.11.23. CHICKEN 44	DAY 7TH	14TH	21ST	28TH	35TH
RIGHT BREAST	—	—	—	—	—
LEFT BREAST	—	—	•	•	† 40TH DAY.

three days at 39° C.; in the left breast with 1 c.cm. of an aerobic culture in rabbit serum glucose broth, incubated three days at 39° C. (Chart 2). Post mortem, there was no tumour in the right breast; in the left a large tumour.

This experiment shows that serum tends to preserve infectivity.

Experiment Dec. 27th, 1923.—Two sterile Erlenmeyer flasks were taken; into each 5 c.cm. of rabbit serum glucose broth were placed. A piece of tumour tissue was now placed in the medium in each flask. One flask was incubated aerobically for three days at 39° C., the flask being covered

CHART 3.

27.12.23. CHICKEN 47	DAY 7TH	14TH	21ST	28TH
RIGHT BREAST	—	—	—	—
LEFT BREAST	—	•		† 22ND DAY.

with a rubber cap to prevent evaporation; the second flask was incubated anaerobically for three days at 39° C. Chicken 47 was then inoculated in the right breast with 1 c.cm. of the aerobic culture and in the left breast with the anaerobic culture (Chart 3). Post mortem, there was no tumour in the right breast; in the left a large tumour.

This experiment shows the advantages of anaerobiosis.

DESTRUCTION OF THE AGENT WITH CHLOROFORM.

Rous [6] showed that carbolic acid, toluene, and chloroform all destroy the agent in a relatively short space of time. I have confirmed all his statements, but here I wish particularly to describe the method of rendering "sand filtrate"—which will produce a tumour in doses of 0·05 c.cm.—innocuous by treatment with chloroform.

Healthy tumour tissue is taken and is disintegrated with sand. The mass is then mixed with Ringer's fluid, the volume of fluid used being 100 c.cm. to about 5 g. of tumour. The mixture is filtered through well-packed paper pulp and sand and the filtrate should be quite transparent. Ten c.cm. of the clear sand filtrate is placed in a boiling tube by means of a pipette. The fluid is delivered neatly to the bottom of the tube without wetting the sides. A few drops of chloroform are then run down the sides of the tube, which is held in a slanting position. In this way, although some of the chloroform sinks to the bottom of the tube to form globules, a portion remains for a time as a thin film on the surface. The tube is then placed in a beaker of water, the temperature of which is 37° C., and is kept in the incubator. After half an hour has elapsed the chloroform globules are taken up in a Pasteur pipette and mixed repeatedly with the bulk of the filtrate. The object of this manœuvre is to facilitate the saturation of the fluid with chloroform. The tube is again incubated in water kept at 37° C., and is left until three hours' incubation has been completed. The chloroform is then removed completely by means of a Geryk pump. "Sand filtrate" which has been treated in the above fashion now fails to infect in doses of 2 c.cm., whereas a control tube treated

similarly, but with saline instead of chloroform, is still infective in doses of 0·2 to 0·25 c.cm.

The following experiment shows the importance of temperature and of complete saturation of the filtrate with chloroform in the destruction of the virus.

Experiment Dec. 12th, 1923.—Chicken 49 was inoculated with 1 c.cm. sand filtrate which had been saturated with chloroform and kept at a temperature of 37° C.; Chicken 50 with 1 c.cm. of the same filtrate which had been saturated with chloroform and kept at room temperature; Chicken 51 with 1 c.cm. of the same filtrate incompletely saturated with chloroform and kept at 37° C. for three hours (Chart 4).

CHART 4

12.12.23. CHICKEN	DAY 7 TH	14 TH	21 ST	28 TH	35 TH
49	—	—	—	—	—
50	—	—	•		† 35 ND DAY.
51	—	—	•		† 38 TH DAY.

For the rapid destruction of the virus the filtrate must be saturated with chloroform and the temperature be kept in the neighbourhood of 37° C. It is to be noted that it is insufficient merely to place the tube in the incubator and expect the contents to attain the temperature in a short time; the tube must be placed in water at the required temperature.

EXPERIMENTS TO SHOW THAT TWO FACTORS EXIST IN INFECTIVE FLUID.

Experiments have already been described in which it is shown that "primary cultures" in broth and in rabbit serum broth become non-infective in two to seven days, the time depending upon the amount of tumour tissue, the composition of the medium, and the conditions of incubation. From the beginning of this work on the Rous sarcoma I suspected that this loss of infectivity does not depend upon the death of a virus, but upon the disappearance of an accessory chemical factor which governs infection of cells. The following experiment shows that this is true. The accessory factor, a product of tumour cells, is obtained by killing the virus in a "sand filtrate" with chloroform in the manner already described. The suspension of the virus consists of a non-infective primary culture.

Experiment Jan. 14th, 1924.—A culture was made by placing a fragment of healthy tumour tissue in 5 c.cm. of rabbit serum glucose broth, contained in a small Erlenmeyer flask, and incubating aerobically at 37° C. for three days. Clear "sand filtrate" was treated with chloroform in the manner already described and the chloroform removed completely under the pump. Chickens were now inoculated as shown in Chart 5.

CHART 5

14.1.24. CHICK	INOCULUM	DAY 7 TH	14 TH	21 ST	28 TH	35 TH	42 ND
66	1 c.c. CULTURE.	—	—	—	—	—	—
67	1 c.c. TREATED FILTRATE.	—	—	—	—	—	—
68	0·5 c.c. CULTURE + 0·5 c.c. FILTRATE	—	—	•			† 38 TH DAY.

It is clear from this experiment, one of many, that a tumour extract—the "sand filtrate"—treated with chloroform and thereby rendered innocuous has a property which, when aided by a property of an inert primary culture, can bring about the formation of a neoplasm. The interpretation of these results, which were first obtained in a rather different form in November, 1923, is as follows. The chloroform-treated "sand filtrate" contains a labile chemical substance which in some way, as yet unknown, renders the cells susceptible to infection by the virus contained in the primary culture. The proof that this is an accurate conception of the process will be made clear later. The existence of two factors in primary cultures can be shown by means of the centrifuge.

SPINNING EXPERIMENTS.

The interpretation of the results obtained with infective fluids which are spun at high speed depends in a large measure, but not entirely, upon the fact that a proportionality exists between size of dose and effect. This is illustrated by the following experiment.

A "primary culture" in rabbit serum glucose broth, incubated at 39° C. anaerobically in a McIntosh and Fildes tin for five days, was taken and the clear supernatant fluid pipetted off without disturbing the tumour tissue at the bottom of the tube. The acidity of the fluid was between pH 5·0 and 5·5. The fluid was spun in a conical tube for two hours at a speed of 9000 revolutions per minute. Rather more than 1 c.cm. of the top layer of the spun culture was then taken off with a Pasteur pipette, the greatest care being taken to avoid disturbing the small amount of deposit at the bottom of the tube. Next, 1 c.cm. was taken from the lowest layers, the deposit being included. A chicken was then inoculated in the right breast with 1 c.cm. of the fluid from the top layer, and in the left breast with 1 c.cm. from the lowest layer. The chicken died in 20 days and when examined post mortem the tumours in the breasts were relatively as indicated in the chart here given (Chart 6).

CHART 6

Such an experiment has been taken to indicate a "shift" of the particulate agents, whether purely under centrifugal force or whether as part of a general shift of large colloid protein masses which form in medium containing tissue. In an ordinary infective disease, the clinical signs of which are elevation of temperature, appearance of a rash or vesicles, and so on, a delay in the appearance of signs would be more difficult to interpret. But with a tumour which always occurs locally at the site of injection and which manifests itself as a swelling, the hazards are less.

With candle filtrates and with five-day cultures in media which do not contain fermentable sugars—i.e., when the pH is 7·8 to 7·9—the shift of virus is so small as to be open to doubt. The effect of acidity in aiding spinning is thus very great; all attempts to spin out the virus completely, even with acid cultures, in this way have failed. An additional advantage is obtained by lining the centrifuge tubes with a thin film of nutrient agar. The agar becomes detached during spinning and, when the machine is stopped, it is found at the bottom of the tube. The exact part which agar plays has not been determined, but it was first employed to provide a material upon which it was imagined the virus would stick firmly. This, however, may be passed over for the present; the fact is that by using agar films acid infective fluid can, by a short period of spinning, be rendered inert in doses double and often treble the usual infective dose, as the following experiment indicates.

Experiment Feb. 7th, 1925.—A portion of a five-day culture of a tumour in rabbit serum maltose broth was spun for 35 minutes in a tube lined with agar. The pH of the culture

CHART 7.

7.2.25. CHICKEN 144	DAY 7 TH	14 TH	21 ST	28 TH
RIGHT BREAST	—	—	—	—
LEFT BREAST	—	•	•	† 32 ND DAY.

had increased from 7·8 to 5·0 during incubation. After spinning, Chicken 144 was inoculated in the right breast with 1 c.cm. of the supernatant fluid; in the left breast with 0·5 c.cm. of the portion of the culture which had not been spun. Chart 7 shows the result. Post mortem, there was no tumour in the right breast.

When the deposit which is obtained by spinning a five-day anaerobic primary culture in rabbit serum glucose broth is washed twice with saline, it is found that the final emulsion of deposit is inert. This might readily be supposed to be because the virus has been washed away. It is not so, however, as can be proved by inoculating a chicken with a mixture of washed deposit and innocuous supernatant fluid, when a tumour forms in the usual time. This is well shown by the following experiment:—

Experiment Sept. 2nd, 1924.—Five-day anaerobic cultures in rabbit serum glucose broth were taken and spun in four conical centrifuge tubes, two of which were lined with agar and two were not. The first spinning was for 40 minutes at 9000 revolutions; the topmost layers were pipetted off from the two agar-lined tubes—in all 4 c.cm. were taken—and put aside. The fluid in the two remaining tubes was pipetted off with care, leaving only the small amount of deposit which had formed. The deposit in each tube was mixed thoroughly with 5 c.cm. of saline and the two tubes again spun at 9000 r.p.m. for 40 minutes. Again the fluid was removed and the deposit mixed with saline and the mixture spun. In this way the deposit was washed twice. It was finally emulsified in 1 c.cm. of Ringer's fluid and the following experiment performed.

Chicken 150 was inoculated with 2 c.cm. of the fluid taken from the agar-lined tubes; Chicken 151 with 0·6 c.cm. of washed deposit plus 0·8 c.cm. Ringer; Chicken 152 with 1 c.cm. of fluid from the agar-lined tubes to which was

CHART 8

2.9.24. CHICK	INOCULUM	DAY 7 TH	14 TH	21 ST	28 TH	59 TH
150	2 cc SUPERNATANT FLUID.	—	—	—	—	—
151	0·6 cc WASHED DEPOSIT.	—	—	—	—	—
152	1 cc SUPERNATANT FLUID + 0·4 cc WASHED DEPOSIT.	—	●	† 20TH DAY.		

added 0·4 c.cm. of washed deposit. Chart 8 shows the result of the experiment.

Chickens 150 and 151 were killed on Oct. 31st, 1925—the fifty-fourth day—and there were no signs of a tumour.

It is not easy to obtain such a perfectly clean result. A more frequent result is indicated in the next experiment.

Experiment Dec. 13th, 1924.—Spinning and washing were carried out as before. Chicken 15 received 1·5 c.cm. of supernatant fluid from agar-lined tubes; Chicken 16 received 0·5 c.cm. of washed deposit plus 0·5 c.cm. Ringer;

CHART 9

13.12.24. CHICK	INOCULUM	DAY 15 TH	18 TH	24 TH
15	1·5 cc SUPERNATANT FLUID.	—	—	●
16	0·5 cc WASHED DEPOSIT + 0·5 cc RINGER'S FLUID.	—	—	—
17	0·75 cc SAND FILTRATE + 0·25 cc WASHED DEPOSIT.	●	●	† 25TH DAY.

and Chicken 17 received a mixture of 0·75 c.cm. supernatant fluid and 0·25 c.cm. washed deposit. The result was as shown in Chart 9.

Chicken 15 eventually died on Feb. 2nd, 1925, 51 days after being inoculated; Chicken 16 was killed three months later and there was no sign of a tumour.

These experiments have been carried out 15 times; in two instances the cultures proved to be non-infective—in each case there was a "concealed contamination"; in two experiments tumours have developed in the chicken inoculated with washed virus, once after 30 days and once after 28 days. The remainder of the experiments are fairly represented by the protocols given.

When candle filtrates of a tumour are taken, made acid with NaH_2PO_4, and spun in the same way the results obtained are of the same kind, but it is more difficult to render the fluid in the agar-lined tubes non-infective.

Experiment Nov. 11th, 1924.—A tumour filtrate (Mandler candle) was acidified with NaH_2PO_4, the pH being brought to 5·5. The acidified filtrate was then spun, the deposit in the two tubes being washed, as in the protocols already given (Chart 10). Post mortem, it was found that the

CHART 10

11.11.24. CHICK	INOCULUM	DAY 7 TH	11 TH	14 TH	21 ST
184	2 cc SUPERNATANT FLUID.	—	—	●	● † 21 ST DAY.
185	RIGHT BREAST: 0·6 cc WASHED DEPOSIT + 0·7 cc SALINE.	—	—	—	—
	LEFT BREAST: 1 cc SUPERNATANT FLUID + 0·3 cc WASHED VIRUS.	—	●	●	† 21 ST DAY.

tumour in Chicken 184 had penetrated the peritoneal cavity into which hæmorrhage had occurred, causing death. The tumour in Chicken 185 was confined to the pectoral region and was much larger than that in Chicken 184.

It will be noted that my practice has been to give double doses of supernatant fluid and washed virus when these are inoculated separately. This, of course, is the recognised safe method of control. If, however, the first and third chickens of an experiment be inoculated with the same volume—usually 0·75 c.cm.—of supernatant fluid diluted with Ringer's fluid for the first chicken and washed virus for the third; then the results are similar to those shown in the first protocol (Experiment Sept. 2nd, 1924).

The experiments show that both in primary cultures and in candle filtrates of the tumour there are two factors which are necessary to the production of a tumour; the one is particulate and is therefore probably a virus; the other, being uninfluenced by spinning, is probably a chemical substance. Neither of these factors operating alone will cause the formation of a sarcoma.

The bearing which these findings have upon the pathology of the Rous tumour and, as will be shown, upon tumours generally, is most important. To return to the central difficulty of tumour ætiology, specificity. It seems to me obvious that, since the virus alone is not infective, the specificity of the Rous tumour must be carried by the second—the chemical—factor derived from cells. (That it is not a toxin or other product of culture is evident from the results of spinning candle filtrates of tumours and from the fact—shown later—that subcultures alone are not infective.) It is very probable that the virus of the Rous tumours VII. and VIII. is the same as that of No. 1†; the chemical factor in each case would, I presume, be different. In this way the specificity is again related to the cells, but in the case of the filterable tumours, to a cell derivative which can be separated from the cells. I propose to call this chemical substance the "specific factor."

At this point it is convenient to refer to attempts to stain and see the virus. Most of the stains recommended for the study of small organisms have been employed in this research. Giemsa's fluid in particular has been thoroughly tried. In order to obviate repetition in the later parts of this paper it is as well to state at the outset that all attempts to stain and see the virus, using for the purpose a 2 mm. apochromatic lens with eye-pieces ranging from 6 to 20, have failed. The "granules" which can be stained in films made from a medium containing tissue have been seen but that they are not the virus is shown by the following observation. A film was made from a five-day primary culture of the Rous tumour in rabbit serum glucose broth; a chicken was then inoculated with 1 c.cm. of the culture. Next the culture was spun at 9000 revolutions per minute for

† This cannot now be tested as the tumours VII. and VIII. have been lost. Dr. Rous very courteously sent me dried powder of the tumours, but they proved to be inert.

40 minutes in an agar-lined tube. The upper part of the fluid was removed with a pipette and a film made; 1 c.cm. of the fluid was then injected into a chicken which did not develop a tumour; the chicken inoculated with the unspun fluid died of a large tumour three weeks later. The films were passed through fixative together and then stained together with Giemsa's long method; both showed innumerable pink granules on the border-line of resolution. Such experiences as these have led me to the opinion that such granules are not the virus. The visual discovery of such small organisms is obviously a special problem in optics. Fortunately, my colleague, Mr. J. E. Barnard, F.R.S., has undertaken this work. His report upon it follows this paper.

THE CULTIVATION OF THE VIRUS IN VITRO.

Whilst the results of spinning experiments show that one factor in the tumour-producing filtrate is particulate and is therefore probably a virus, the proof of multiplication in vitro is essential for the final justification of this conclusion. To describe completely the attempts, successful and unsuccessful, to cultivate the virus would expand this paper unreasonably; details will be left to the technical journals. Here it is sufficient to say that the most useful medium employed is that which has been described already. To 6 c.cm. of rabbit serum KCl broth a fragment of chick embryo is added. The age of the embryo used has generally been 12–16 days. The tube is then inoculated with a loopful of primary culture and is now called the first subculture. It is incubated in an anaerobic tin at 35°–36° C. for four days, when the second subculture is made into similar medium containing freshly removed embryo. The maximum growth as judged by the results of experiments on chickens is obtained on the fourth to fifth day of incubation.

The dilution with each subculture is at least a thousand times; in a fifth subculture, therefore, the original inoculum has been diluted 10^{15}, or a thousand billion times. If tumours are produced with subcultures beyond the fifth we may be certain that growth has taken place. The following protocols show results obtained with such subcultures.

Experiment Sept. 18th, 1924.—Chicken 157 was inoculated with 1 c.cm. of sand filtrate which had been treated with chloroform; Chicken 158 with 1 c.cm. of a fifth subculture of

CHART 11

18.9.24 CHICKEN	DAY 8 TH	14 TH	21 ST	42 ND
157	—	—	—	—
158	—	—	—	—
159	—	●	●	† 25 TH DAY.

the tumour virus; Chicken 159 with 0·5 c.cm. of the sand filtrate plus 0·5 c.cm. of the fifth subculture. The results are seen from Chart 11.

Experiment Dec. 4th, 1924.—On Dec. 2nd, 1924, fragments of tumour were placed in tubes of glucose broth and the tubes incubated anaerobically in a McIntosh and Fildes tin for two days at 39° C. On Dec. 4th supernatant fluid was taken from the tubes without disturbing the tumour

CHART 12

4.12.24 CHICK	INOCULUM	DAY 14 TH	21 ST	28 TH	52 ND
206	1 cc SUPERNATANT FLUID.	—	—	—	—
210	0·5 cc SUPERNATANT FLUID + 0·5 cc OF A FIFTH SUBCULTURE OF VIRUS.	—	●	●	† 31 ST DAY.
211	2 cc OF THE SAME FIFTH SUBCULTURE OF VIRUS.	—	—	—	—

tissue. The fluid was spun in agar-lined tubes for an hour and three quarters at 9000 revolutions, and the supernatant fluid pipetted off. Chickens were then inoculated as shown in Chart 12.

Experiment April 27th, 1925.—In this experiment an eighth subculture of virus was used. Chloroformed sand filtrate was prepared as before and chickens inoculated as shown in Chart 13.

CHART 13

27.4.25 CHICK	INOCULUM	DAY 7 TH	14 TH	21 ST	28 TH
168	1 cc SAND FILTRATE.	—	—	—	—
169	1 cc 8 TH SUBCULTURE.	—	—	—	—
170	0·5 cc SAND FILTRATE + 0·5 cc 8 TH SUBCULT.	●	●	●	† 28 TH DAY.

MAMMALIAN TUMOURS.

Four standard tumours of rats and mice have been studied. These are: (1) A spindle-celled sarcoma of the mouse, strain 37/S of the Imperial Cancer Research Fund; (2) the Jensen rat sarcoma; (3) a carcinoma of the mouse, strain 63; and (4) a rat carcinoma, strain 9, both of the Imperial Cancer Research Fund. The mouse tumours 37/S and 63 give 100 per cent. of takes in mice, metastasise, and always kill the host. The rat tumours often retrogress. All four tumours are accepted as genuine neoplasms by competent pathologists in this country and abroad.

The first part of the investigation was a re-examination of the filterability of the sarcomata. In this work, during the early months of 1924, I enjoyed the assistance of my colleague Dr. W. J. Purdy. The mouse tumour 37/S, especially, was thoroughly tested. The method of preparing extracts was similar to that described for the chicken tumour. The candle used was a Chamberland L_1, which permits *B. prodigiosus* to pass when a rich broth culture is filtered; cells, however, are invariably kept back. In different experiments the tumour tissue was ground with sand at freezing-point, at room temperature, and at 37° C. The diluent was varied from time to time; the pH was varied from extreme acidity to extreme alkalinity. But under no conditions were we able to produce a tumour with a cell-free filtrate. It may be taken as certain that the mouse sarcoma 37/S is not a filterable tumour in the sense that the Rous chicken sarcoma is. The same may be said of the Jensen rat sarcoma, though fewer experiments were made with this tumour. The carcinomata were not reinvestigated.

Mouse Sarcoma 37/S.

The survival of the tumour cells in vitro was first tested. This was repetition of unpublished work which I had first carried out in 1918–19 whilst on the staff of the Imperial Cancer Research Fund. The general result of these studies is that the tumour cells die relatively rapidly when incubated at 37° C. in Ringer's fluid or broth. This is illustrated by a typical experiment.

Several tumours were excised aseptically and minced with sharp scissors; 1 c.cm. of the mince was then delivered by means of a syringe into 5 c.cm. of Ringer contained in a test-tube. Another portion of the mince, contained in a sterile capsule, was kept in the cold. The tube of Ringer containing tumour cells was now placed in a beaker of water the temperature of which was 37° C. and kept at this temperature for 18 hours. Two series of 12 mice were now inoculated, one with the incubated tumour cells which had been separated from the Ringer by spinning; the second set with the tumour emulsion which had been kept in a sterile capsule in the cold. The second set of mice developed tumours in the usual way, whilst those injected with incubated cells remained exempt and were eventually killed.

The explanation of the early death of cells is certainly not simple. The addition of serum tends to preserve the viability of cells, as does also an abundant supply of oxygen. Absence of oxygen—for incubation

in Ringer is partial anaerobiosis—plays an important part in the lethal process. When a piece—about a gramme—of healthy tumour is dropped into a tube of rabbit serum KCl broth and the tube is incubated 24 hours in an anaerobic tin and the clear supernatant fluid then injected into mice, about 50 per cent. of the animals develop tumours which appear usually on the fourteenth to eighteenth day and attain a large size—2–3 g.—in four to five weeks. The tumours thus produced have the structure characteristic of 37/S, and behave identically when transplanted in other mice. Are they produced by inoculation of an occasional cell which survives anaerobic incubation? Or are they genuine new growths produced by infecting the host's own cells with a virus derived from the incubated tumour tissue? It is probable from what has already been said that the second explanation of their origin is the correct one. The following experiments prove this.

A number of healthy tumours were removed and placed—about 2 g. per tube—in tubes of rabbit serum KCl broth. The tubes were now put into a McIntosh and Fildes anaerobic jar which was evacuated with a Geryk pump. As the pressure in the jar fell gases bubbled out of the tubes and especially from the surface of the tumour tissue. Pumping was continued till no more gas was given off. Hydrogen was then run into the jar and the coil of platinised asbestos warmed with an electric current in order to achieve complete anaerobiosis. The jar was incubated at 37° C. for three hours and was then again evacuated. This time the medium in the tubes, being warm, boiled under the reduced pressure. In this way the air entangled on the tumour was completely removed. The jar was made anaerobic and then incubated for 24 hours at 37° C. The jar was now opened, the fluid in the tubes pipetted off, spun in the centrifuge, and the topmost layers of fluid taken off and inoculated into mice. The mice had well-developed tumours in 14 days, which were removed in 21 days and the experiment repeated with them. The same result was again obtained. Thus by incubating under perfectly anaerobic conditions the percentage of tumours obtained *may* reach 100. The following is the protocol and chart of the second experiment.

Experiment April 30th, 1925.—About 1 g. of healthy tumour tissue was placed in a tube of rabbit serum KCl broth; incubated 25 hours anaerobically in a jar. On May 1st

CHART 14

30.4.25 MOUSE	DAY 7 TH	14 TH	21 ST
1 BLACK & WHITE ♀	—	●	●
2 YELLOW ♀	—	●	●
3 WHITE ♀	—	●	●
4 CHOC. & WHITE ♂	—	—	•

four mice were inoculated, each with 1 c.cm. of supernatant fluid (Chart 14). Lest doubt remain that cells have survived anaerobic incubation and originated tumours, the following experiment was performed.

Experiment May 22nd, 1925.—Cultures were made as before by adding healthy tumour tissue to medium and incubating 24 hours at 35° C. The cultures were now mixed in a boiling tube and one half inoculated into mice (A); the liquid remaining was filtered through a Chamberland L_1 candle. Chart 15 shows the result of the experiment. Primary cultures of 37/S, incubated for three days in this way fail to produce tumours. Proof that this is not due to death of the virus will be given in another paper. Charts 14 and 15 are the best results obtained. When dry necrotic tumours are used the results of inoculation may be quite negative.

It is now certain that a typical mammalian sarcoma (37/S) can be transferred with a cell-free filtrate, under the special conditions described. The Rous chicken tumour is thus, in reality, not exceptional; it differs from the mammalian sarcoma 37/S merely in the fact that its accessory chemical factor is either more abundant or more stable. All the evidence points to the oxygen lability of the chemical factor and it is possible that the explanation of the uniform failure

CHART 15

MOUSE	7 TH DAY	14 TH DAY	21 ST DAY
A. MICE INOCULATED WITH UNFILTERED CULTURE.			
1 YELLOW ♀	—	•	●
2 FAWN ♀	—	•	●
3 DARK FAWN ♀	—	•	●
4 BLACK & WHITE ♀	—	•	●
B. MICE INOCULATED WITH FILTERED CULTURE.			
1 BROWN ♀	—	•	●
2 BROWN ♀	—	•	●
3 BLACK ♀	—	•	●
4 BLACK & WHITE ♀	—	•	●
5 BLACK & WHITE ♀	—	•	•
6 BROWN & WHITE ♀	—	•	●

to transfer 37/S with tumour filtrates is due partly to the oxidation of the specific factor in grinding with sand, and partly to the excessive dilution necessary to form a filterable mixture.

Jensen's Rat Sarcoma, Rat Carcinoma 9, and Mouse Carcinoma 63.

It will be observed that proof of the existence of an extrinsic cause of 37/S sarcoma proved to be a lengthy and laborious research. For the remaining three tumours an indirect method has been adopted to obtain the same information. The method consists in substituting the virus of one of these tumours for that of the Rous sarcoma in the manner indicated in the following experiments:—

Experiment April 17th, 1925.—Sand filtrate of Rous chicken sarcoma was prepared from healthy tumour tissue. The filtrate was perfectly clear, faint yellow in colour, and viscid. 10 c.cm. were saturated with chloroform and then incubated in a beaker of water kept at 39° C. The chloroform was completely removed by means of a Geryk pump and the following experiment was made:—

Chicken 251 was inoculated with 1 c.cm. of the filtrate; Chicken 252 with 0·5 c.cm. of the filtrate to which was added 0·5 c.cm. of a culture made by adding a fragment of 63 carcinoma to rabbit serum KCl broth and incubating

CHART 16

17.4.25 CHICKEN	DAY 7 TH	14 TH	21 ST	42 ND	70 TH
251	—	—	—	—	—
252	—	●	●	† 21 ST DAY.	
253	—	—	—	—	—

anaerobically for three days at a temperature of 36° C.; and Chicken 253 was inoculated with 1 c.cm. of the culture of 63 carcinoma. The result is shown in Chart 16.

It is evident from this experiment, which has been repeated many times, that the culture of 63 carcinoma can replace the virus of the Rous tumour. The tumours thus produced cannot be distinguished histologically or biologically from the Rous tumour.

The next protocol is included to show how important is the preparation of the specific factor.

Experiment May 9th, 1925.—Clear sand filtrate was prepared from a Rous tumour and two lots, each of 10 c.cm., were taken. To one a few drops of chloroform, insufficient to saturate the mass, were added and the mixture incubated for three hours; to the second lot of 10 c.cm. rather more than 1 c.cm. of chloroform was added and saturation facilitated by repeated mixing. The second tube was incubated for 5 hours. Chickens were inoculated as follows:—

(*a*) Chicken 284 was injected with 1 c.cm. sand filtrate insufficiently treated with chloroform; Chicken 285 with 0·5 c.cm. to which was added 0·5 c.cm. of a three-day primary culture of carcinoma 63; and finally, Chicken 286 was inoculated with 0·5 c.cm. of filtrate diluted to 1 c.cm. with 0·5 c.cm. saline. The result is indicated on Chart 17.

CHART 17.

9.5.25 CHICK	DAY 7 TH	14 TH	21 ST	POST MORTEM
284	—	—	•	KILLED 23RD DAY. SMALL TUMOUR. NO METASTASES.
285	—	•	●	DIED 22ND DAY. LARGE TUMOUR. DEPOSITS IN LUNGS AND LIVER.
286	—	—	—	KILLED 42ND DAY. NO TUMOUR.

(*b*) Experiment with sand filtrate treated with excess of chloroform and incubated five hours. Details are shown on Chart 18.

CHART 18

9.5.25 CHICK	INOCULUM	DAY 7 TH	21 ST	42ND
287	1 cc FILTRATE.	—	—	—
288	0·5 cc FILTRATE + 0·5 cc CULTURE OF MOUSE CARCINOMA 63.	—	—	—
289	0·5 cc FILTRATE + 0·5 cc CULTURE OF RAT CARCINOMA 9.	—	—	—

Rat Carcinoma 9 and Jensen's Rat Sarcoma.

These tumours will be taken together in order to save space. Cultures of them are made in the usual manner by adding a fragment of healthy tumour to a tube of rabbit serum KCl broth. Carcinoma 9 usually becomes very hæmorrhagic and a young tumour must therefore be taken. In the case of the Jensen rat sarcoma retrogression is so common that it is advisable to chart the tumour frequently in order to be certain that it is taken in the growing phase. Such cultures may now be substituted for the Rous cultures, as in the experiments already taken from protocols for tumour 63.

Experiment May 15th, 1925.—10 c.cm. of water-clear sand filtrate of a Rous tumour was taken and treated with chloroform. The following chickens were inoculated: Chicken 291 with 1·5 c.cm. treated sand filtrate (specific factor), Chicken 292 with 0·5 c.cm. filtrate plus 0·5 c.cm. saline, Chicken 293 with 0·5 c.cm. filtrate plus 0·5 c.cm. of a twelfth subculture of the Rous tumour, Chicken 294 with 0·5 c.cm. filtrate plus 0·5 c.cm. of a culture of rat carcinoma 9, and Chicken 295 with 0·5 c.cm. filtrate plus 0·5 c.cm. of a culture of the Jensen rat sarcoma (Chart 19).

Again, the tumours produced with the specific factor of the chicken sarcoma, together with cultures from the rat tumours, do not differ in structure from the ordinary Rous No. 1.

It has now been shown that the non-specific factor can be obtained from three mammalian tumours. Experiments with subcultures of these tumours are not yet complete, but there is no reason to doubt that the element provided is a virus.

HUMAN TUMOURS.

Tests with three tumours only have been completed. One of these, for which I am indebted to Dr. A. G. L. Reade, was a scirrhous carcinoma of the breast. Cultures were made, but proved to be contaminated. Nevertheless, chickens were inoculated with the culture and specific factor but results were negative. The second was a sarcoma of the thigh, pieces of which were kindly given to me by Sir Cuthbert Wallace. The cultures which were made from this tumour were uncontaminated, but experiments on chickens failed

CHART 19

15.5.25 CHICK	INOCULUM	DAY 7 TH	11 TH	14 TH	21 ST	P.M.
291	1·5 cc SPECIFIC FACTOR.	—	—	—	—	† 35TH DAY. NO TUMOUR.
292	0·5 cc SPECIFIC F. + 0·5 cc SALINE.	—	—	—	—	† 35TH DAY. NO TUMOUR.
293	0·5 cc S.F. + 0·5 cc 12TH SUBCULTURE OF ROUS TUMOUR VIRUS.	—	•	●	●	† 24TH DAY.
294	0·5 cc S.F. + 0·5 cc 3RD DAY CULT. OF RAT TUMOUR 9.	—	●	●		† 18TH DAY
295	0·5 cc S.F. + 0·5 cc CULTURE OF JENSEN RAT SARCOMA.	—	?	●		† 18TH DAY

completely. The third was an adeno-carcinoma of the breast; I am indebted to Prof. G. E. Gask for the opportunity to test it. Cultures were made both from the tumour itself and from an axillary gland which was enormously enlarged. There was no contamination in the cultures. The experiment was made on May 23rd, 1925. Chart 20 shows the result.

CHART 20

23.5.25 CHICK	INOCULUM	DAY 7 TH	14 TH	21 ST	28 TH
296	1 cc SPECIFIC FACTOR OF CHICKEN SARCOMA.	—	—	—	—
297	0·5 cc S.F. + 0·5 cc CULTURE OF HUMAN TUMOUR IN R.S.KCl BROTH, 4 DAYS AT 36°C.	?•	●	●	†
298	0·5 cc S.F. + 0·5 cc CULTURE OF GLAND IN R.S.KCl BROTH, 4 DAYS AT 36°C.	—	●	●	†

Chick 297 died on the twenty-third day; and Chick 298 on the twenty-eighth day.

The tumours produced were again indistinguishable from the Rous tumour.

One human tumour then behaves like the rat and mouse tumours. The negative result with the human sarcoma may mean that a group of viruses—not interchangeable—exist which cause tumours, but obviously more experiments must be done before an opinion can be formed. The failure with the scirrhous tumour can be ignored owing to the contamination of the culture.

DISCUSSION.

It has now been shown that the Rous tumour No. 1 is caused by a virus which has been cultivated; that the mouse sarcoma 37/S can be transmitted with cell-free filtrate; that the rat tumours 9 and J.R.S. and the mouse carcinoma 63 and a human breast carcinoma all provide a factor which can replace the virus of the Rous tumour in the genesis of a chicken sarcoma.

The common factor of the last four tumours is almost certainly a virus. The production of tumours with remote subcultures remains to be done. Further, it has now been shown that the virus alone is unable to bring about the malignant transformation of a cell. An adjuvant, fortunately provided in abundance by the chicken sarcoma, is necessary; this adjuvant

I have called the specific factor. Superficially, it might be thought that Bail's term "aggressin" would appear satisfactory, but a casual analysis of the facts relating to an aggressin shows that this is not so. As an example of an aggressin the toxin of *B. welchii* will be taken. The toxin is separated from the bacilli by filtration and the minimal lethal dose for mice determined. Bacilli, conveniently grown on solid medium are washed free of toxin, and are then found to be perfectly harmless to mice. If, now, mice are inoculated with a sublethal dose of toxin to which has been added washed *B. welchii*, an infection is set up, more toxin is produced in vivo, and the mouse eventually dies of a spreading gangrene with toxæmia. When the bacilli added to the toxin are *B. welchii* the infection produced is characteristic of *B. welchii* infections; when *Vibrion septique* is added the disease produced is characteristic of *Vibrion septique*;[7] and similarly, toxin-free harmless tetanus spores mixed with sublethal doses of *B. welchii* toxin produce tetanus.[8] Thus, the specificity in these cases depends upon the microbes; the aggressin, acting equally well for all three, produces a microscopic lesion which in some way, not yet fully understood, enables these anaerobic organisms, which alone are harmless saprophytes, to proliferate in the tissues and there to make their characteristic poisons. These facts have been established by experiments similar to, but much easier to perform than, those which have been employed in the work described in this paper. The differences between an aggressin and the specific factor of a tumour are evident.

These researches have led me to look upon cancer—using the term in its widest sense—as a specific disease caused by a virus (or group of viruses). Under experimental conditions the virus alone is ineffective; a second specific factor, obtained from tumour extracts, ruptures the cell defences and enables the virus to infect. Under natural conditions continued "irritation" of tissues sets up a state under which infection can occur. The connexion between the specific factor of a tumour and an irritant remains to be investigated. Some of the relatively unimportant "irritants" are known, such as coal-tar, paraffin oils, &c. The virus probably lives and multiplies in the cell and provokes the cell to continued multiplication.

The methods of experiment now described, and the obvious extensions of them, give the means of classifying the viruses, of investigating the nature of the specific factor, and of testing suspected "irritants," such as preservatives in foods, which may play a rôle in the genesis of a tumour.

I am indebted to the Executive Committee of the Imperial Cancer Research Fund for placing at my disposal their unrivalled series of animal tumours. My thanks are due to my former chief, Dr. J. A. Murray, F.R.S., for his continued critical interest in the work. To my colleague, Dr. W. J. Purdy, I am indebted for assistance in many experiments, for help in the routine inoculation of tumours, and for the preparation of charts; over and above this direct help, I desire to acknowledge the advantages I have derived from his criticisms both of experiments and the interpretations placed upon results. Finally, I wish to state that I owe much to my laboratory servant, Mr. W. Hall, for his willing service.

REFERENCES.

1. Peyton Rous: Jour. Med., 1911, xiii., 397.
2. P. Rous, J. B. Murphy, and W. H. Tytler: Jour. Amer. Med. Assoc., 1912, lix., 1793.
3. P. Rous and J. B. Murphy: Jour. Exp. Med., 1914, xix., 52.
4. P. Rous: Jour. Exp. Med., 1913, xviii., 416–427.
5. P. Hartley: Jour. Path. and Bact., 1922, xxv., 482–483.
6. P. Rous and J. B. Murphy: Studies from the Rockefeller Institute for Med. Res., 1913, xvi., 253.
7. Bullock, W. E., and Cramer, W.: Proc. Roy. Soc., B, 1919, xc.
8. W. J. Tulloch: Proc. Roy. Soc., B, 1919, xc., 145.

THE MICROSCOPICAL EXAMINATION OF FILTERABLE VIRUSES

ASSOCIATED WITH MALIGNANT NEW GROWTHS.

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(With Illustrative Plates.)

Introduction.

THE search for filterable viruses by microscopical methods presents problems of great difficulty, due for the most part to the optical limitations of the microscope. The evidence that such organisms exist is based upon numerous experiments in which infective material has retained its infectivity after passing through a filter that will not pass the smallest known visible organism. There is at present no method in general use by which such filters can be standardised, and it is therefore not certain that filterable viruses can be regarded as organisms of any definite order of size. Other factors than size of the organism influence the result of filtration experiments, not the least being variability of the filters themselves and the viscosity of the filterable material. If filtration did give more exact information as to the size of any given organism it would then perhaps be advisable to adopt some other standard of reference than permeability. Such a standard might be the limits of microscopical resolution, by which all bodies of less than 0·25 μ in their greatest diameter should be regarded as filter-passers, although in that case some other more suitable name might well be found.

It is necessary to consider the main factors limiting both visibility and resolution in the microscope as these limits operate so definitely in any attempts to see or to photograph small bodies. It is also of interest to realise the probable size of filterable viruses in relation to the smallest micro-organism on one hand, and a large molecule on the other. The latter limits are shown diagrammatically in Figs. 1 and 2. The inner circle A in Fig. 1 may be regarded as a hæmoglobin molecule, molecular weight 16,600 approximately. The circles B, C, D, represent the orders of microscopical resolution obtainable if certain ultra-violet radiations are used of wave-lengths 232 μμ, 257 μμ, and 275 μμ respectively; they do not indicate the magnitude of relative wave-lengths. The circle E represents the relative position of the green line in mercury wave-length 546 μμ, with which the visual observations have been made. Between the positions A and B, therefore, no method at present exists by which microscopical resolution can be obtained. (The millimicron μμ = one-thousandth of a micron, 10^{-7} cm.) It is convenient to use the micron for microscopic dimensions and the millimicron for wave-length estimations. To enable a comparison to be made with an organism of known size, reference must be made to Fig. 2, which is on one-tenth the scale of Fig. 1. In this the relative wave-lengths are represented by the small inner circles B, C, D, and E, and the outer circle F represents a body of 1·0 μ in diameter, the average size of a small micrococcus. On reference again to Fig. 1 it will be seen that to obtain the necessary microscopical resolution, a term which will be explained later, and which is proportional to the wave frequency of the light used, it is necessary to use light of wave-length 275 μμ if a body of 0·1 μ in diameter is to be represented, whereas wave-length 257 μμ would resolve down to approximately 0·075 μ, a dimension that is of importance in the present investigation. Fig. 2 gives some idea of the possible sizes of filter-passers. It is certain that they are made up of a considerable number of complex molecules, but no exact limit is assignable in either direction. There are, however, two physical considerations that do suggest a limit of smallness. One is the difficulty here would be for a small body to overcome its

relatively great surface tension and to divide and reproduce itself by binary fission as larger organisms do: the other is the mean free path, or Brownian motion, which it would acquire if it exists as a separate particle. There are reasons to think that these conditions are provided against in the life processes of small organisms, and the evidence that this is so will be detailed later; at the same time these factors must and do operate at times, and they may therefore be regarded as limiting factors in any estimation of size. There are other circumstances that cannot be detailed here suggesting that filterable viruses are of sizes represented by the distance between B and D,

FIG. 1.

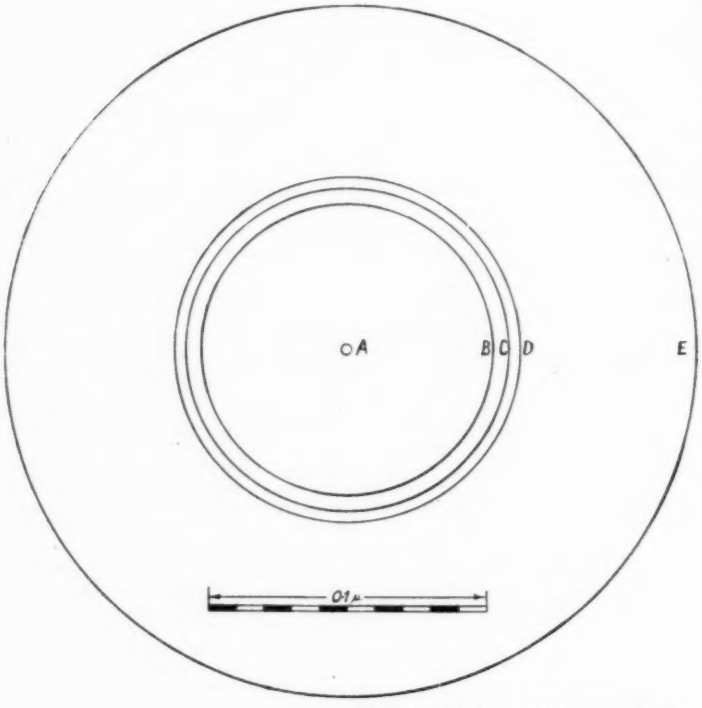


FIG. 2.

Diagrams to show relative magnitudes.

and can therefore be photographed by ultra-violet light of the wave-lengths indicated. No objective has yet been constructed which works to or near the theoretical limit that the shortest of these wave-lengths should give, but experimental efforts indicate that such will be evolved in due course.

The Microscopical Limits of Observation.

Microscopic objects may be divided into two classes, those that are seen by transmitted light and those that can be made self-luminous. The former are seen as the result of partial or of selective light absorption, that is, they may be semi-opaque, the elements of structure absorbing more or less light, or they may be seen in colour as the result of selective absorption as in a stained preparation. For an object to be self-luminous, it must be illuminated in such a manner that no direct light reaches the micro-objective but only that which is refracted, diffracted, or scattered by the object itself. Under these conditions an object is seen as a bright image on a dark background and the method is known as dark-ground illumination. The main purpose in all microscopical observations is to obtain the greatest resolution, and the term, "limits of resolution," is applied to that state of affairs in which no further separation of elements of structure is obtainable. Only late in the last century was it definitely recognised that there are theoretical limits beyond which the microscope as ordinarily employed cannot go, and these theoretical limits are now all but reached under proper conditions of use. If two points in an object are within a certain limiting distance of one another they cannot be separated by any known means. Further, if an isolated element of structure is smaller than a certain limit the image seen does not represent its exact form or size. Magnification as such does not help, as, however much the image may be enlarged, there is no resulting increase of resolution. The main factors governing resolution are the numerical aperture of the objective used and the wave-length of the light employed. The best results are therefore to be expected when numerical aperture (N.A.) is large and the light used of the shortest wave-length practicable. While this power of delineating fine detail is of primary importance in all observation, another factor comes in with self-luminous objects which is hardly less important, and that is visibility. The term "ultra-microscope" is often inaccurately applied to all illuminating appliances that render an object self-luminous, but it should in fact only be used to describe apparatus which renders particles visible that are smaller in all dimensions than the resolution limits. In actual practice this limit is reached with isolated objects or elements of structure that are less than 0·25 micron in diameter. When objects larger in any dimension than this limit are being so observed the method may be described as "dark-ground" illumination, whereas, when the objects are smaller, "ultra-microscopy" is the correct term. Neither dark-ground illumination nor the ultra-microscope can be regarded as a means of increasing resolution, their main purpose being to obtain greater visibility, although the full resolving power of any given lens may be secured by this means. In the light of recent experiments it is, in fact, clear that full resolving power is obtained more certainly by an efficient dark-ground illumination method than by any other means. In theory there is no limit to the smallness of an object that can be made visible if a sufficiently powerful illuminant is used. In practice, however, the dark-ground illumination limits are governed by the following conditions:—

(1) That the particles under observation can themselves scatter enough light to enable them to be seen.

(2) That the particles are separated from one another by intervals that are within the limits of resolution of the microscope objective used.

(3) That there is sufficient difference of refractive index between the particles and the medium in which

they are immersed. Only under certain very limited conditions can the full resolving power of the best oil-immersion objectives available for visual work (those in which N.A. = 1·4) be secured by this means. The limits in biological work are less than this, and are imposed by the refractive index of the medium in which the objects to be examined are immersed. As these are rarely widely different from water (with a refractive index of 1·33) it follows that the N.A. of any objective used could not exceed about 1·27. In practice the use of even this N.A. introduces difficulties when there is but a small difference of refractive index between object and medium. The method that appears to be most satisfactory, therefore, is to use an illuminator with such an illuminating angle that it admits of the use of an objective of 1·20 N.A. for all preliminary and routine observations. The highest practicable N.A. 1·27 is reserved for use in cases where circumstances are favourable, a point that can only be determined by experience. The highest practicable resolution, therefore, by dark-ground methods is that which enables an object of the order of 0·35 μ to be seen and perfectly resolved, although much smaller bodies may be rendered visible and some of their physical properties determined. The limits of dark-ground methods in the search for filterable viruses are therefore obvious, but it has been found in practice that much preliminary work can be done. The only other method likely to be of service is, therefore, to use light of a short wave-length as indicated already. Approximately a body may be photographed of one-half the size of the wave-length used. The simple formula governing resolution is given by the relation, $a = \frac{1}{2}\lambda/\sin a$, where λ is the wave-length of the light employed when passing through the medium used, and a is the angle emitted by half the diameter of the back lens of the objective. Thus the value of d, which is the limiting distance between two particles, or the size of a single particle if a correct image is to be seen, can be reduced by increasing aperture or decreasing the wave-length of light used as an illuminant. The former factor is determined by the objective and for visual work cannot be increased. The latter can in theory be altered to any extent, and the usual expression for attainable resolution $\frac{\lambda n}{2\mu \sin a}$ can be diminished so that a filterable virus of any probable size should be resolvable. This is at least what theory indicates, and the direction of experimental work in the department of applied optics is to make such radiations available as are needed for any particular purpose. The present position is not discouraging, but it is admitted that many practical difficulties have yet to be overcome.

It follows, therefore, that there are at present only two methods of attack if a microscopical image of a filterable virus is to be obtained:—

1. The observation of the living material by dark-ground illumination methods in which visibility would be secured in terms of the size of the particular virus.

2. The use of light of short wave-length (that is by means of invisible radiations) resulting in higher resolution, proportionate to the wave frequency.

Both of these methods exclude any process such as staining, in which changes will certainly occur owing to the preparation or fixing of the material. Gye has already referred to the difficulties he experienced in endeavouring to demonstrate organisms in infective material. It is evident that in cases where the body to be observed is below the limits of microscopical resolution, any staining method would be useless. Even more, such processes would destroy the only recognisable characteristic that such bodies possess, the difference that there might be in physical, and particularly in optical qualities, between them and inert particulate matter. In the dark-ground arrangement this would be evident mainly in terms of visibility, but by the use of ultra-violet light it is possible to obtain a real image of a small body providing a short enough wave-length is used.

Dark-ground Illumination Methods.

The apparatus used for this method may now be briefly described. The source of light is a quartz mercury-vapour lamp of the non-vacuum type as designed for microscopy. Colour screens are used to give either monochromatic blue, green, or yellow. The green line in mercury is peculiarly suitable as it is a narrow one and so approaches closely to a true monochromatic light source. Further, as this line is in that part of the spectrum to which the eye is most sensitive it is possible to work with light of low intensity, a point of the utmost importance in dark-ground work.

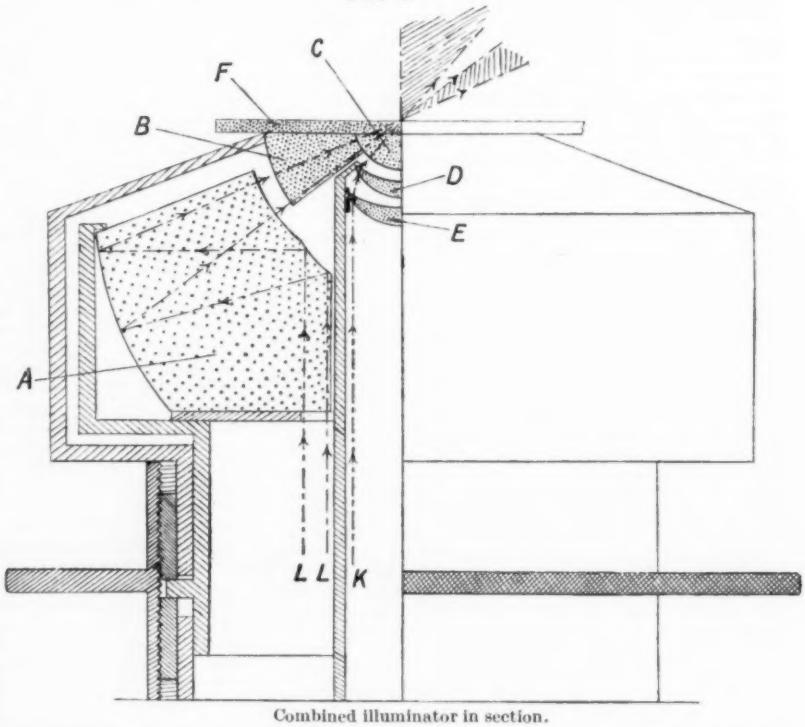
It is commonly stated, even in text-books, that a powerful light source is necessary, but this only results in such irradiation from larger particles that all fine detail is lost. A stable, well-made microscope is essential as all adjustments must be made with the utmost care. Thus, perfect centration of every part must be secured and the slide and cover-glass must be truly normal to the optical axis of the microscope. Full instructions for setting up a dark-ground illuminator will be found in the Special Report Series No. 19 issued by the Medical Research Council. The illuminators used have been designed to work with 2 mm. apochromatic objectives of 1·2 N.A. and 1·27 N.A., and the whole outfit is made by Messrs. R. and J. Beck, Ltd. Both these condensers work at their best with slides of the thickness of a No. 2 cover-glass. The material to be examined is therefore mounted between two cover-glasses and these are held in a chamber designed for the purpose. Provision is made to ensure that the layer under examination is as thin as possible, regard being paid to the necessity of preventing undue compression. A semi-darkened room is essential for this work, and the illuminant must be so shielded that no direct light reaches the eye at any time. Another essential is to provide means for reducing the light intensity without altering its quality. This is best secured by using semi-platinised glass screens prepared by the method described in the writer's book on photomicrography. A high-power compensating ocular × 18 to × 25 is necessary for final observations and the objectives mentioned will tolerate these perfectly.

The Microscope for Ultra-violet Photography.

The mechanical part of the microscope used is of special construction, as no ordinary one would fulfil the required conditions. Its essential features are great stability and high accuracy of all movements, and its general design is seen in Plate I., Fig. 1. Both the coarse and fine adjustment A_1 and A_2 are actuated through a large accurately-cut screw of the type usually employed on an interferometer, the bed being a heavy casting of girder type supporting the whole. The objective and ocular are carried on separate carriers O_1 and O_2, with no body-tube between them as in an ordinary microscope. This ensures that the adjustment of either optical part does not disturb the other. The mechanical stage is strongly supported so that it is truly at right angles to the optical axis. The two milled heads A_4 control the movements of the object on the stage within certain limits, but the quartz slide is held in a novel manner to give some freedom of movement by hand, while ensuring that the slide is always kept in close contact with the stage, a matter of moment in ultra-violet work. The combined dark-ground and ultra-violet light illuminator O_3, described later, is supported on a strong centreing sub-stage, which is moved by an accurate screw controlled by the large graduated head A_3. This is, in fact, a divided circle enabling the dark-ground or the ultra-violet light illuminating apparatus to be accurately focussed in any wave-length. The mercury-vapour lamp M_1 is mounted on a subsidiary optical bench which is arranged at right angles to the axis of the microscope. At M_3 a reflecting prism is mounted which can be swung into line, thus enabling the beam of light from the mercury-vapour lamp to be projected into the

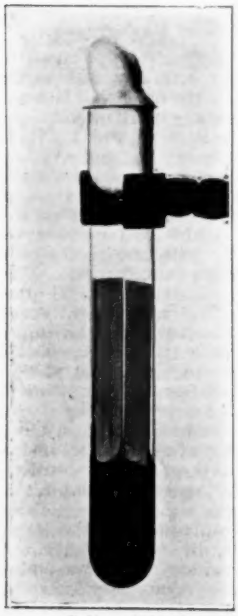
microscope. When the prism is swung out of line ultra-violet light from the spark-gap S_1 is projected by the quartz lens S_2 through the quartz prism S_3, and so into the central part of the microscope condenser. The arrangement therefore admits of either illuminant being brought into use by simply deflecting the prism M_3. This description is of necessity superficial, and assumes some knowledge of the orthodox methods of ultra-violet light microscopy, a full description of which by the writer can be found in the "Dictionary of Applied Physics." One of the main differences in principle here introduced is that focussing in any wave-length desired is performed in reference to the dark-ground image seen in the green line in mercury wave-length 546 $\mu\mu$. Focussing by means of the fluorescent image is both difficult and dangerous owing to the action of ultra-violet light on living organism. Changes can be set up which might be regarded as normal appearances in the organism. The actual exposure, therefore, of any material to ultra-violet must be the shortest possible. There is no reason to regard the action on living organisms as a trigger action, a certain time factor is involved, but precautions must be observed to ensure that no change due to the light itself is set up. A long series of investigations on the action of ultra-violet on bacteria has been carried out so that this part of the subject is understood; an account of these experiments will be published in due course. There is no reason to regard the filterable viruses that have been under observation as more sensitive to ultra-violet light than ordinary bacteria; there is, in fact, some evidence that they are less sensitive, but this point again requires further investigation. The actual microscopical method employed has therefore been the composite one indicated, and consists of the use of a high aperture dark-ground illuminator already described, mounted concentrically with and encircling a quartz condenser. The former secures visibility and is used for purposes of search and location; the latter is available for use with any suitable ultra-violet radiation and enables a transmitted light image to be secured on the photographic plate. The problem of the best quartz objective to use is still only partly solved; much remains to be done to ensure that the best result should be obtained in any given wave-length. In collaboration with my colleague, Mr. John Smiles, this part of the work is being attacked with every evidence that success will follow. One photograph is shown in which light of 257 $\mu\mu$ wave-length is used, and this is certainly the shortest wave-length recorded as having been so applied to microscopy.

FIG. 5.



Combined illuminator in section.

FIG. 3.



Culture tube showing the disposition of glass slips.

FIG. 4.

Methods of Cultivation.

Cultural methods have been devised and carried out by Gye and are described by him in the foregoing paper. It was, however, found necessary to design some arrangement by which it could be determined whether colonies were developing, and to examine these colonies in situ. From the nature of the growth obtained in fluid there was some reason to doubt whether it would be possible to obtain growth on solid media. Further, as the quantity of growth in fluid, in relation to the volume of medium, is not so prolific as with ordinary organisms, it was regarded as probable that any colonies obtained would be few in number and small in size. A means of examining the surface of serum-agar was therefore desirable in which a 2 mm. oil-immersion objective could be used. Thus it was really necessary to apply to the medium for the detection of colonies a means that would ordinarily be used for the detection of organisms. Briefly, the arrangement that has been found successful is seen in Figs. 3 and 4. An ordinary test-tube is taken, preferably of rather large size, and into it three thin glass slips are introduced in the configuration seen in Fig. 3.

These three slips form a triangle in plan, Fig. 4, and are of such a width that they are free to move in the direction of the length of the tube but cannot

MR. J. E. BARNARD: THE MICROSCOPICAL EXAMINATION OF FILTERABLE VIRUSES.

PLATE I.

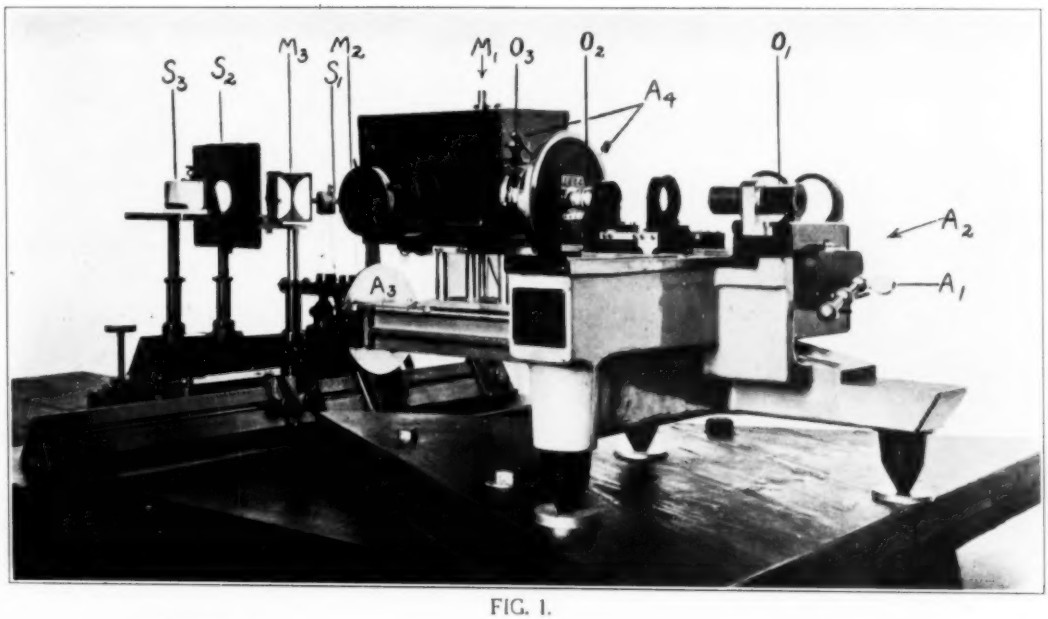


FIG. 1.

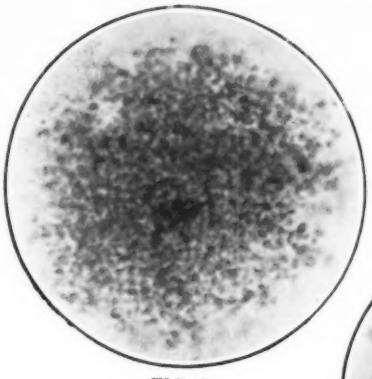


FIG. 2.

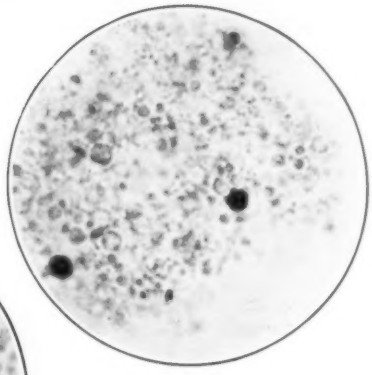


FIG. 3.

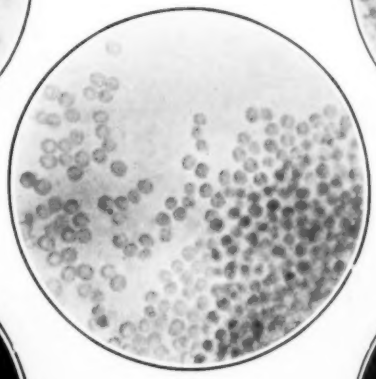


FIG. 6.

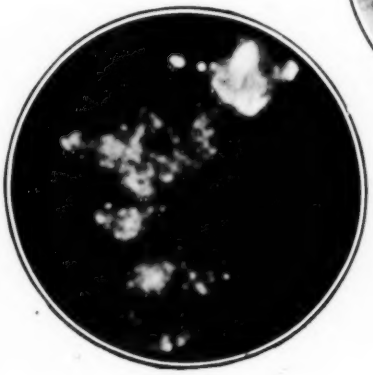


FIG. 4.

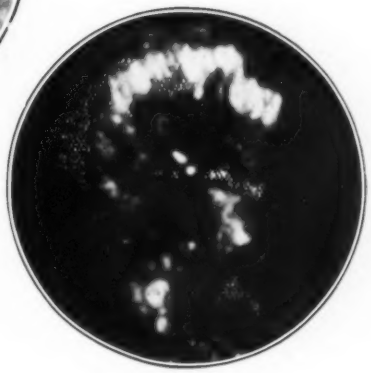


FIG. 5.

PLATE II.

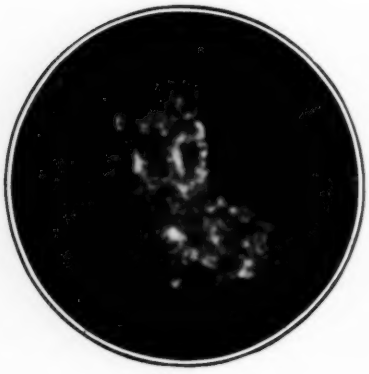


FIG. 1.

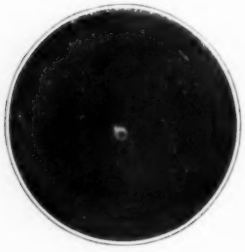


FIG. 2.

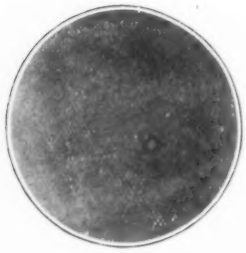


FIG. 3.

FIG. 4.

FIG. 5.

FIG. 6.

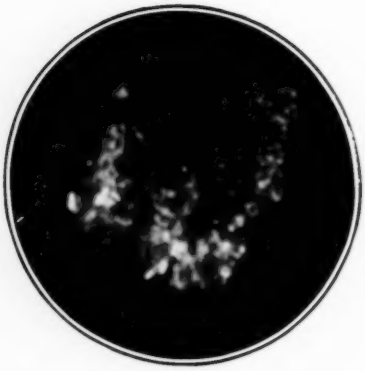


FIG. 7.

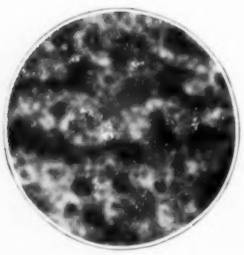


FIG. 8.

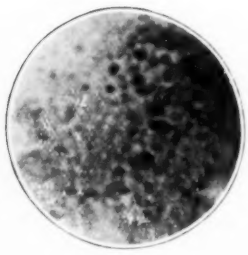


FIG. 9.

move in any other way. They dip into the agar medium seen at the bottom of the tube, and when the agar solidifies are quite stable. The agar is melted, the serum added in the ordinary way and inoculated with the infective material. After inoculation and before solidification the tube is tilted so that the agar runs along the tube and touches the external face of each slip of glass in turn. The amount of agar left on the glass is determined by the temperature, but it is always possible to repeat the tilting process, several times if necessary, until enough medium remains. The tube containing the three slips is incubated and at any suitable period one slip is removed for examination, the remainder going on for a longer period if desired. Either glass or quartz slips may be used so that examination is possible by the dark-ground method or photographs can be taken in ultra-violet light.

In either case a cover-slip of glass or of quartz is placed on the slide so that cedar-wood oil or glycerine may be used as an immersion medium. The serum-agar usually has sufficient surface moisture to secure optical contact between cover-glass and agar layer. It is doubtful whether colonies would have been detected without this method, and a fuller description will be published later by Mr. F. Welch, who has taken so large a part in working out the details.

Description of Combined Illuminator.

The design of this double purpose illuminator is seen in Fig. 5. The front lens of the central quartz condenser is seen at C, the other two lenses of this combination are D and E. The front lens is in glycerine immersion contact with the quartz slide F, on which the object is supported. The outer quartz ring B is part of the dark-ground illumination appliance and is mounted as shown to transmit the dark-ground beam without alteration of direction on striking the quartz lens C. It will be appreciated that this lens C is an essential part of both systems (in the drawing the closely dotted parts are of quartz, while the wider dotting indicates glass). The ultra-violet light therefore passes through the quartz system in the direction K, as shown, and is focused at the point of observation. The dark-ground illumination, portion A, is an annular glass reflector substantially as shown, which transmits its illuminating beam of visible light also on to the point of observation. By sliding a central stop into the apparatus the quartz system is obscured, while the outer dark-ground portion is covered at will by an annular stop. It follows, therefore, that either part may be used by simply inserting the suitable stop. The light energy required for ultra-violet work is supplied by a high-tension alternating spark between suitable metallic electrodes. The electrodes are selected to give any required wave-length, and a fuller description of this will be found in the author's book on Photo-micrography, now in the press. The method of focussing the image in ultra-violet work has hitherto been by means of a fluorescent screen. The image formed by the quartz ocular is thrown on to such a screen, and is then observed by a short-focus telescope. Focussing by this means is always difficult and sometimes impossible, if the object is a translucent one; further, it entails considerable exposure of the object to ultra-violet light. To minimise the difficulty small mercury droplets may be deposited by sublimation on the quartz slide before the material under observation is mounted. Such droplets can be deposited in almost any order of size by variation of temperature of the mercury and time taken for its deposition. Some droplets are seen as dark discs in Plate I., Fig. 3, and this method has proved of value. The combined illuminator has in most cases, however, rendered their use unnecessary, as visibility can usually be secured sufficiently to focus an image in monochromatic green light, and with the accurate microscope described the focussing in ultra-violet becomes a purely mechanical process.

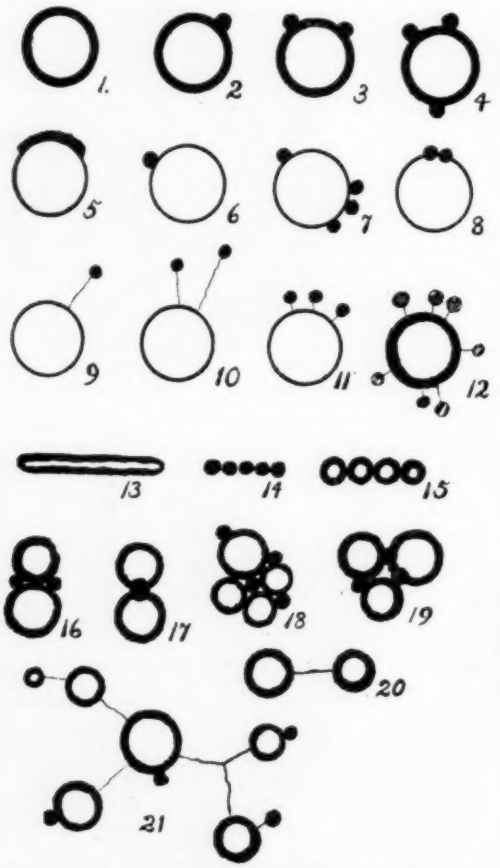
Observations.

The microscopical search for any filterable virus had been prepared for in part by a continual effort to improve the mechanical and optical parts of the microscope, and some definite advances had been made before any material was available. During the war some experimental work on trench fever suggested that something might be done by studying the optical characteristics of infective material. Further, a considerable amount of work had been done with bovine pleuro-pneumonia, as this appears to be the smallest organism known to grow under ordinary bacteriological methods of cultivation. There was, however, no cultural material available of an undoubted filter-passer until the successful cultivation of the Rous fowl sarcoma by Gye. The earliest efforts to observe this organism were of the simplest character, and consisted of the careful observation of uninoculated culture-media side by side with observation of inoculated tubes of subsequently proved infectivity. Dark-ground illumination as described already was employed, and to ensure that the comparison should be exact two microscopes of similar design and with the same optical equipment were set up. Thus infective and non-infective material could be examined and compared under identical conditions, an arrangement that has proved of great value. All the conditions described herein as being essential for accurate observation were carefully observed. Further, as a control, cultures of pleuro-pneumonia were kept going similarly, and observations were made on this organism in the same way. Any tube of infective material that contained bodies not to be seen in a similar uninoculated tube was then examined under the combined microscope, and if practicable an ultra-violet photograph obtained. Thus a dark-ground visual image was observed and ultra-violet photograph obtained that under favourable conditions would give an image of an isolated element of structure down to an order of size of 0·075 μ. The observations on pleuro-pneumonia were all carried out on living material, and not in reference to stained preparations. These are still being carried on by my colleague Mr. John Smiles at this institute, and will be described fully by him in due course. Briefly, however, these observations lead to some tentative conclusions. Thus the pleuro-pneumonia organism is a small particulate body about 0·2 μ diameter which can only grow and reproduce itself under certain conditions. The particulate form is accompanied by and is dependent for its reproduction on a larger spheroidal body which develops from the particulate form and which then forms the host on which the particulate form can develop further.

Fig. 6 shows diagrammatically the sequence of events as we understand them at present. After about 20 hours a tube that has been inoculated from an agar surface colony will show a number of spheroids that may be represented as No. 1. A few hours later a small refractile dot is seen on one part of the spheroid as No. 2, subsequently developing further bodies as in 3–4. Some spheroids appear to have a thickened wall, while others are thin and of low visibility, but recent observations suggest that this apparent thickening is due to a number of particulate bodies below the limits of size that can be visually resolved. The attached particle then tends to move away from the spheroid, but is still attached to it. This attachment is rarely observed visually, but ultra-violet photographs show it to be a fine filament which is derived from the spheroid and gives to the latter an amœboid appearance. Some particles soon develop into small spheroids and form groups, as in 16, 17, 18, 19, each of them developing attached particles substantially as shown. In most cases, however, the spheroid tends to disintegrate, or at least become less visible, and finally gets into an unstable physical state, somewhat as shown in 12 and 21, where the central spheroid is still evident but is surrounded by a number of smaller spheroidal bodies. This formation is quite

characteristic, but can only be appreciated when actually seen under the microscope. The grouping and movement in fluid is an interesting physical phenomenon in which a rotating spheroidal body unevenly loaded with particles appears to assume a form suggesting a spiral disposition. That the particles can and do develop into spheroids has been proved by careful filtration experiments. Thus a fluid culture has been filtered by us through a Bechhold collodion membrane of such porosity that it passes the particulate forms but keeps back all visible spheroids. The filtrate was incubated for 12 hours at 37° C. without any evident change, but a fresh tube of serum broth inoculated from it and incubated during the same period show that all the particulate forms had developed into spheroids, and the full life-cycle ensued. The explanation of the life-cycle may, therefore, be that the spheroids take the place of the living cell in providing conditions suitable for reproduction. In very young colonies of pleuro-pneumonia (see Plate I., Fig. 2) the particulate forms do apparently divide for the first few hours only, and are then immersed in some excretory material which reduces their surface-tension. Soon, however, the spheroids develop on the outer edge of the colony, and further reproduction takes place on these in the manner described. The argument is too long for full extension here, but it does appear to be the means by which the difficulty of subdivision by a small body is overcome. It is certain that this organism does not divide in the same way as do ordinary bacteria. The difficulty of growing them artificially, particularly on solid media, suggests that some special conditions are necessary, but speculation is futile until the exact physical conditions are better understood. A long series of comparative observations on cultures, all of which have ultimately been proved by animal experiments to be infective, has led to the conclusion that the same type of phenomenon, but on a smaller scale, is to be observed in the Rous fowl sarcoma, mouse sarcoma 37/S and latterly in human carcinoma, as can be seen in cultures of pleuro-pneumonia. In no essential point is there any difference, except that the cultures from malignant growths are slower in developing and do not produce such rich cultures. Probably no single factor has hindered the cultivation of filterable viruses so much as the assumption that a culture in broth, for instance, must become opalescent, or that a growth on solid media must develop colonies easily visible to the naked eye. If as we think probable the spheroids are an essential part of the life-history of these organisms then, owing to their low refractive index, they would require to be present in impossibly great numbers to produce evident cloudiness. The fluid cultures from malignant growths always remain clear; on solid media the colonies are so small that they require the use of a high-power objective to see them. The incubation period has not usually exceeded seven days, and examination of the cultures and similarly incubated uninoculated tubes has been made from three days onwards. During that period the same life-cycle has been observed in all cases as that seen in pleuro-pneumonia. Observation is more difficult than with pleuro-pneumonia owing to the small size and lower visibility of the malignant growth viruses. The microscopical technique has, therefore, to be carefully adapted to these more exacting conditions. Unless considerable care is exercised the spheroids may easily be confused with other spherical bodies occurring in most organic fluids. This can only be obviated by a careful preliminary study of uninoculated culture-media.

FIG. 6.



Diagrammatic representation of bodies seen in cultures of bovine pleuro-pneumonia.

Description of Plates.

PLATE I.

FIG. 1.—Microscope described in text.

FIG. 2.—Young colony of bovine pleuro-pneumonia photographed in ultra-violet light. × 1200.

FIG 3.—Edge of an older colony showing spheroids. × 1800.

FIG. 4.—Young colony showing particulate form. Dark-ground illumination. × 1850.

FIG. 5.—Older colony showing development of spheroids. × 1850.

FIG. 6.—The edge of a young colony of *M. pyogenes aureus*, photographed in ultra-violet light to show normal development of an organism. In this case the line of subdivision is seen before the organism changes its external form.

Figs. 2 to 6 are colonies grown on slips by the method described.

PLATE II.

FIG. 1.—Rous fowl sarcoma colony on agar slip. Dark-ground illumination. × 1850. The particulate bodies are seen centrally in small bright masses, the spheroids developing on or near the edge.

FIG. 2.—Rous fowl sarcoma. An isolated spheroid with attached particle. Dark-ground illumination. × 1850.

FIG. 3.—Same as Fig. 2, but photographed in ultra-violet light. The attached particle is seen to be a small spheroid. × 2000.

FIG. 4.—Mouse sarcoma. 37/S. Colony on agar slip. Dark-ground illumination. × 1850. Considerable development of spheroids.

FIG. 5.—A small portion of the colony photographed in ultra-violet light. Wave-length 275 $\mu\mu$ showing that the spheroids may depart rather considerably from a spherical form at some stages of growth. × 2200.

FIG 6.—Same as Fig. 5, but photographed in ultra-violet light. Wave-length 257 $\mu\mu$. × 2200. Showing the ultimate particulate character of the spheroids. From this and other photographs in the same wave-length it is estimated that the particulate form of the virus is of the order of size of 0·075 μ. It is certainly appreciably less than 0·1 μ, as resolution cannot be obtained with any greater wave-length.

FIG 7.—Human carcinoma. Colony on agar slip. Dark-ground illumination. × 1850. The same general characteristics are to be seen as in Figs. 1 and 4.

FIG 8.—A small portion of the edge of a larger colony showing spheroids interspersed with particulate bodies. × 1850.

FIG. 9.—A portion of the edge of the same colony as seen in Fig. 8 photographed in ultra-violet, light wave-length 275 $\mu\mu$.

The general conclusions to be drawn from the photo-micrographs are that the developmental stages in each of the above are similar. It is feared that the reproduction will not show so well as the original negatives, particularly in those done in ultra-violet light. The difficulties are greatly increased owing to the relative opacity of serum-agar to ultra-violet light, the possibility of obtaining photographs at all being due to the thinness of the layer of culture medium. In addition, the negatives are very thin and lacking in contrast, although they do in the originals show much delicate detail.

NOTE ON THE PRECEDING PAPERS.

By J. E. BARNARD AND W. E. GYE.

The separate parts of this investigation have now been described, and it remains to indicate how far the results obtained fit together. Our belief that the small bodies seen and photographed are the actual virus depends partly upon the fact that control uninoculated tubes of medium have been invariably blank, and partly upon the correspondence between the microscopical findings and the results of experiments upon animals. This correspondence—allowing for the real difficulties in both parts of the common task—has been so close that, although final proof has not been attained, we are convinced that our conclusions are sound. By final proof we mean the cultivation of the virus from a single colony, or if possible from a single spheroid, and the production of a tumour with the culture thus obtained. This work has been under consideration for a long time, and will be attempted when circumstances permit.

THE

Bowman Lecture

[ABRIDGED]

ON

THE FOUNDATIONS OF VISION.

Delivered before the Convention of English-Speaking Ophthalmological Societies on July 16th, 1925,

BY SIR JOHN HERBERT PARSONS, C.B.E.,
HON. D.SC. (BRISTOL), F.R.C.S. ENG., F.R.S.

[AFTER making introductory reference to Sir William Bowman and his work, the lecturer went on :—]

I propose to delve into the very foundations of the physiology of vision in the hope that a survey of the facts brought to light may elicit some general principles which will clarify our knowledge and point the way to further research.

In so far as the quest is successful its utility will not be limited to vision and to ophthalmology; its repercussions must inevitably be felt in the whole domain of the physiology of the senses and in the psychology which is the conscious expression of that physiology. For our waking life is a continuous cinematographic exhibition, in which varying perceptual patterns succeed each other upon the screen of each individual's experience. Each pattern is, in psychological language, a "presentation," a living picture, in which one feature occupies the focus of attention, surrounded by other more faintly apprehended features which form a relatively indifferent field. It must not be supposed that any such picture is a purely visual presentation, such as we see in a picture gallery. It is a composite picture made up of elements derived from all the so-called senses, and perhaps the object of consciousness is simply to combine and synthesise these diverse factors, in a way which is incomprehensible when viewed simply from the standpoint of the summation of physical quantities. Yet in man the prepotent factor is generally the visual factor, just as in many lower animals the prepotent factor is that derived from the sense of smell.

INTEGRATION OF PHYSIOLOGICAL IMPULSES.

The integration of these diverse physiological impulses is an active—kinetic—process, and it manifests itself in kinetic consciousness. But there are hierarchies of integration, and when a lower level integration has proved sufficiently serviceable to any given species it becomes part and parcel of the make-up of the individuals of the species. It then generally assumes the characters of potential consciousness, or in common terms is relegated to the "unconscious."

Further, there are many such integrations at every level—and there are many levels, only great groups of levels being collected within the confines of such terms as reflexes, instincts, and so on. Physiologically, the lower levels are, in vertebrates, associated with the activities of the spinal cord and medulla; higher levels with the mid-brain and thalamus; higher still with the palæo- and neo-pallium.

There are comparatively simple integrations and there are integrations of simpler integrations, forming different "patterns" *in* each level and *at* each level. And the most important point is that *all these patterns are of biological significance*—they are adaptations in the service of the individual or the species. Hence the most significant features of any pattern are themselves extremely complex. What I mean can be best shown by an example from ontogenesis. In very early days of life a child's attention is attracted by a bright light, and the eyes are moved so that the image of the light is formed on the macula of each eye. A child is soon most attracted towards its mother, and its behaviour towards her differs according to the tone of the mother's voice, her facial expression, and so on. Now, facial expression is a very complex visual presentation, and it is scarcely conceivable that at this very early age the child has succeeded in accurately correlating the innumerable visual impulses into which a facial expression can be analysed. We must rather regard the child's impression as a psychological pattern made up of the integration of a number of relatively undifferentiated auditory, visual, and other complexes, of which the still relatively undifferentiated visual complex forms the focus. It responds to this complex by appropriate behaviour simply because through countless preceding generations its ancestors have responded to similar and even less differentiated complexes.[1] The lower down the animal scale the less differentiated are the complexes to which the individual responds—and his responses are biologically determined—i.e., they are strictly utilitarian. Hence we conclude that the behaviour response is dominated by the psychological pattern, and that higher patterns dominate lower patterns. But, since the lower patterns are more primitive they are the least vulnerable—teleologically because they are concerned with vital processes upon which the survival of individual and species depends. The higher patterns are more highly differentiated and therefore more vulnerable. So that even these complex psychological patterns can be divided into two great groups—one, protopathic and of vital import, and another epicritic and of gnostic import.

PROTOPATHIC AND EPICRITIC SENSIBILITY.

I have adopted the terms protopathic and epicritic from the work of Head and Rivers on the tactile sensibility, feeling assured that the fundamental conception is justified, though I do not agree with all the detailed conclusions arrived at by Head.

Using the terms in the wider sense, we may say that the cognitive element of the crude protopathic response is diffuse, vague, and ill-defined. There is reason to think that the adequate stimulus produces the maximum response at the threshold—the reaction is of the all-or-none variety. The higher differentiation of the cognitive element introduces differentiatcn of

another nature. The response, while retaining many of the characteristics of the protopathic response, especially as regards its quality, is better defined, susceptible to finer gradation, endowed with more accurate local signature and discrimination, less charged with affective tone, and of greater gnostic significance. This higher differentiation of sensory responses may be termed epicritic in contradistinction to protopathic. It should be noted that it is to be regarded as differentiated and evolved from the protopathic; and just as a highly differentiated cell in the multicellular organism still retains the fundamental characteristics of a living cell in spite of its special differentiation, so each epicritic sense retains the fundamental quality of the protopathic.

The crude protopathic sensibility was essentially utilitarian in the most fundamental sense; upon it depended the survival of the individual and the species. So important is it that it cannot be wholly replaced by the more delicate epicritic mechanism. Hence it is found to persist alongside the epicritic in most of the senses even in the highest animals, though generally modified from its primitive character.

Moreover, the crude primitive protopathic sensibility had to possess that *potential plasticity* which permits of differentiation along many lines. The more highly differentiated epicritic sensibility lost perforce this type of plasticity. Endowed, however, with richer and more sharply defined cognition it was eminently suited to provide a more active, *dynamic plasticity* within a narrower field.

The protopathic phase is seen in its most characteristic form in the lowest vertebrates; the epicritic in the highest. Between the two are many gradations of each which are difficult to unravel; but both anatomical observations and physiological experiments support the view that there is a dual mechanism at work.

[The differentiation of tactile sensibility into protopathic and epicritic was then discussed, and described in various animals.]

THE MOTOR FUNCTIONS OF VISION.

Visual organs of an extremely primitive type occur very low down in the animal scale. At first they consist of a single receptor cell, which like nearly all receptor cells, is generally provided with hair-like processes. Like other receptor sensory cells they are provided with diplosomes, and often fibrils can be shown passing from the diplosomes into a nerve-fibre attached to the proximal end of the cell. Even at this lowly stage the visual cells are almost always situated in direct relationship with one or more pigmented cells, though this is not absolutely essential to the functioning of such cells as visual cells.

It may be considered definitely proved that these cells respond to luminous radiation, and give rise to appropriate motor responses in the organisms in which they occur. Thus the one primitive and indubitable response to the visual impulse is *motor*. What, if any, are the other responses is a matter of conjecture.

The motor response in the lowest forms is a tropism—a movement either towards or away from the light. The organisms certainly respond to wave-lengths which to us are luminous, but we are not justified in concluding that the range of spectrum which is adequate to their visual organs is the same as that adequate to ours. It may be less or more; and further research is needed on this point. Thus, it may well prove that the organs respond not only to wave-lengths which are luminous to us, but also to infra-red and ultra-violet radiations. It is only what might be expected if the crude protopathic sensation of these organisms should prove to be an undifferentiated temperature-luminous response.

The essential feature of these tropisms, whether positive or negative, is that they are directional responses, and as such are the germ of that projicience which reaches its highest development in the visual sense of man.

[After referring to the visual organs in primitive vertebrates, such as the amphioxus, the lecturer proceeded:—]

VISION IN RELATION TO EQUILIBRATION AND ORIENTATION.

"It is clear that in the visual functions of this animal we have to do only with very *primitive*, essentially *vital visual* functions. The organs do not apprehend objects, but serve merely to regulate the posture of the body in relation to the light (photostasis)" (Kappers).[2] In other words, the sensation is purely protopathic; and the fundamental protopathic response to light is motor—i.e., postural.

It is noteworthy here that in certain invertebrates—e.g., hydromedusæ—some possess simple pigmented ocelli, whilst others have static organs with statoliths, similar to the otoliths in the ear. The function of the static organs in the orientation of the animal is undoubted, and it would appear that at this lowly stage ocelli are capable of fulfilling the same purpose (Hesse).[3]

The immense importance of vision for equilibration and orientation is liable to be lost sight of, or at least underestimated, when dealing with the visual functions of man; for there the static functions are overshadowed by the more patent dynamic functions, and both are overwhelmed by the highly developed sensory and cognitive functions. A study of the anatomy of the central nervous systems and of the behaviour of vertebrates, however, demonstrates the supreme importance of photostasis in the life-histories of these animals from the lowest to the highest. Throughout, in the mid-brain, we find an elaborate coördination centre for gravistatic and photostatic reflexes, of which the afferent impulses are predominantly protopathic. This region is the great meeting-place of primitive protopathic sensory impulses—optic, static, tactile, olfactory and gustatory,—the median longitudinal bundle playing an important rôle as a collecting tract. In fishes the gravistatic system is enormously reinforced by impulses from the lateral lines, impulses which convey impressions of pressure and mechanical vibrations, controlling the movements of the animal with regard to depth below the surface of the water, and propinquity to solid obstructions.

[The lecturer then adverted to the nervous levels and paths concerned in vital reflexes in various animals.]

Clinical observations, and especially Brown-Séquard lesions, show that all the protopathic fibres—mediating pain, temperature, and undifferentiated touch—have a cell-station immediately after entering the cord, and are then relayed into Edinger fibres which decussate in the anterior commissure and pass up in the lateral columns of the opposite side to the medulla, mid-brain, and thalamus. The epicritic fibres—mediating finer tactile discrimination, muscle and joint sensibility, and deep sensation—pass up the cord in the posterior columns to the nuclei cuneatus and gracilis, and are thence relayed to the median fillet, decussating only when they reach the medulla (Petrèn, Fabritius, Brouwer). The epicritic system in the cord is therefore a collection of fibres carrying impulses specially concerned in *stereognostic* perception. It cannot, however, be admitted, with Head, that a perception such as the discrimination of the distance between two compass points placed upon the skin is directly transmitted by any fibres in the cord. Such a perception involves higher syntheses than the spinal cord is capable of, and it is, indeed, inconceivable how it could be conducted by any single tract. Epicritic tactile sensibility mediates finer discrimination by finer differentiation of the crude protopathic sensation, and the psychological manifestations of this differentiation are more minutely accurate local signature and qualitative differences of greater cognitive (as opposed to affective) import. Thus, the protopathic sensations are of more immediately vital, the epicritic of gnostic import.

The foundation of equilibrium is posture, and the key to the solution of the problem of posture was the discovery of decerebrate rigidity by Sherrington.

Magnus and de Kleijn divide postural reflexes into two great groups—static and stato-kinetic. The former deal with changes in posture of the otherwise stationary animal; the latter with movements of the animal. The stato-kinetic reflexes are the more complicated, and in them the semicircular canals play a large part, whereas only the otolith organs are involved in static labyrinthine reflexes.

Static reflexes are further divided into two groups—postural reflexes proper (*Haltung*) or standing reflexes (*Stehreflexe*), and righting reflexes (*Stellreflexe*).

Standing reflexes are accompanied by *compensatory eye movements*. The tonic labyrinthine ocular reflexes are exhibited when the position of the head in space is altered, and consist of vertical and rotatory deviations. If the head is rotated to the right (right eye down, left eye up) the right eye moves upwards and the left eye downwards. If the head is rotated upwards around the bitemporal axis (as in affirmation), the eye undergoes torsion such that the top of the vertical meridian of the cornea moves forwards towards the nose. It will be seen that the labyrinthine reflexes are of such a character as to retain the visual field so far as possible in its normal orientation; but in no case is this effect fully accomplished. The effectors of the labyrinthine ocular reflexes are the superior and inferior recti and the obliques. The lateral recti play no part.

The tonic ocular reflexes initiated in the neck muscles are demonstrated in lateral flexions (negation) of the head. When the head is turned to the right the right eye turns forwards (towards the nose), the left eye backwards. Here, too, the eye movements are compensatory, and the lateral recti are involved.

The combined effects of the neck and labyrinthine reflexes are almost completely compensatory, so that the orientation of the field of vision is maintained in spite of the (passive) movements of the animal. When active movements of the animal occur stato-kinetic labyrinthine reflexes are set in action by changes in velocity owing to stimulation of the semicircular canals. These also lead to vertical, horizontal, and rotatory deviations. "These reactions are such that with a given movement of the head of an animal which is in the normal posture the eyes are moved into the position in which they will later be maintained by the static reflexes, so that they are deviated into the necessary direction at the very beginning of the movement, and there is, therefore, an extraordinarily well-developed correlation of ocular labyrinthine and neck reflexes, by means of which, both in movement and at rest, and in the various physiologically possible positions of the head with respect to the body and in space the correct visual attitude and the suitable correlation of the two eyes are ensured" (Walshe).[4]

Of the righting reflexes certain visual reflexes occur only in those animals which have some degree of binocular vision, and then only in the intact animal. They differ, therefore, fundamentally from all the other reflexes, in that they are subserved by the cerebral cortex (probably the visual cortex).

In active movements the coördinations between eyes and labyrinths are equally important, as are also the compensatory effects of each upon the other. In the primates and in man, with the development of binocular vision, vision comes more and more to dominate the labyrinth, acting vicariously for the labyrinth in case of need. The distance-receptor, smell, was the foundation upon which the neopallium was begun, and upon the distance-receptor, vision, it attained its highest perfection in man. Upon the labyrinth was built the "ganglion of the proprioceptive system," the cerebellum. Just as the cerebrum is the highest—apocritic—differentiation and integration of exteroceptive impulses, so the cerebellum is the highest—apocritic—differentiation and integration of proprioceptive impulses, itself under the domination of the cerebrum for the unification of the animal's "self."

THE SENSORY FUNCTIONS OF VISION.

The universality of the dual mechanism in the exteroceptive sensations would naturally lead one to seek for evidence of the same duality in vision. It must, however, be remembered that the superposition of an epicritic upon a protopathic mechanism not only leads to the subordination of the latter, but also to alterations in its characters. Protopathic touch is characterised by the intensity of the reaction, though accompanied by vagueness and crudity, absence of exact localisation and discrimination, radiation to distant parts, and pronounced affective tone, usually unpleasant. The response is of the all-or-none variety—i.e., any stimulus which surpasses the threshold produces the maximum effect—there is no gradation. Any reflex motor response is of the same ungraded nature—i.e., it is a "mass-reflex" (Head and Riddoch). When, after division of a sensory nerve, epicritic sensibility returns, protopathic sensibility undergoes definite modifications. "Some of its elements persist and combine with elements of the epicritic stage to form features of normal cutaneous sensibility. Certain characters are suppressed or inhibited, especially radiation and distant reference. Similarly, the mass reflex occurring in complete transverse lesions of the spinal cord is suppressed in the normal subject. In these suppressions "*Such elements as are serviceable are utilised when the later and higher forms of sensibility came into existence. . . . It is only those of early sensibility which are incompatible with later developments which are suppressed*" (Rivers).[5]

The Duplicity Theory.

One of the best supported hypotheses relating to vision is the so-called duplicity theory.[6] According to it, scotopic vision, or vision under low intensities of illumination by the dark-adapted eye, is carried out by means of the rods, and photopic vision, or vision under higher intensities of illumination by the light-adapted eye, is mediated by the cones. It would seem at first sight that we have here ready to hand the duality which is demanded by the protopathic and epicritic theory. And, indeed, there are many facts which strongly support this view.[7] Scotopic vision shows many of the characteristics of protopathic sensibility, especially in its vagueness and crudity, its undifferentiated character, and lack of exact localisation and discrimination. Photopic vision shows many of the characteristics of epicritic sensibility, especially in its meticulous exactitude of localisation and discrimination—the highest indeed which has been acquired by any form of sensibility [8]—and in its greater *differentiation qualitatively in the perception of colours.*

On the other hand, special features of protopathic sensation are its "all-or-none" reaction and its tendency to initiate a "mass reflex." The protopathic light-sense, so far as it has been investigated at present, does not exhibit either of these characteristics. But if we regard it in its primitive manifestations it is more than probable that it then exhibited both. In higher animals it has become differentiated into the epicritic phases, but still persists in modified form underlying the epicritic manifestations. The primitive protopathic light-sense we must regard as vague, diffuse, and not accurately localised. If it persisted in this form unmodified, when the light-sense became more definitely projicient it would interfere with exact discrimination. The suppression of these features, however, has become complete only in the macula, the area of distinct vision. Further, the projicient senses are concerned with the initiation of anticipatory or precurrent reactions. It is the contact exteroceptors which are specially concerned in consummatory reactions.[9] Anything in the nature of a mass reflex action to projicient sense stimulation would frustrate the object of this adaptive mechanism;

hence the modification of such a response from the protopathic light-sense.

But if protopathic vision has lost some of the characteristics of primitive protopathic sensibility it appears to have gained some epicritic characters in its manifestations in normal man. Thus, it shows gradation, as exemplified in the luminosity curve of scotopic vision. Moreover, it is not improbable that in certain conditions it can show some of the qualitative differentiations of epicritic vision under strong intensities of excitation. There is practically no evidence as to what happens to the scotopic mechanism when the intensities of stimulation are such as to educe photopic vision. If the stimulus is increased above the chromatic threshold, what happens with regard to the scotopic mechanism? Is it inhibited, as the protopathic optic thalamus is inhibited by the cortex, which is predominantly epicritic in function? Is it short-circuited—perhaps owing to the complete bleaching of the visual purple—or does it contribute to the brightness element of photopic vision, or does it acquire all the characteristics of photopic vision, contributing not only to the brightness, but also to the other qualitative—chromatic—effects? Now, one of the greatest difficulties, hitherto unsurmounted, of the duplicity theory is the behaviour of the periphery of the field of vision. There is overwhelming proof, derived from peripheral luminosity curves, minimal field and minimal time luminosity curves,[10] that peripheral vision behaves in exactly the same manner as central vision, but with diminished sensitivity. Greater stimuli are required to produce equivalent responses, but if the stimuli are sufficiently great, the differences disappear, including even the qualitative differences, so that the fields of vision for colours extend to the extreme periphery.[11] Anatomically, the peripheral retinal neuro-epithelium consists almost entirely of rods—the scotopic or protopathic mechanism. It seems probable, therefore, that under high intensities of excitation in normal man the protopathic mechanism is capable of giving the same chromatic responses as the cones, or essentially epicritic mechanism.

THE APPRECIATION OF MOVEMENT IN THE LOWER VERTEBRATES.

One outstanding feature of vision in the lower vertebrates is the appreciation of movement. This is an adaptation of the highest biological significance, since upon a rapid apprehension of movement in enemy or prey may depend the preservation of life. It is therefore to be expected that this characteristic will be bound up with the most primitive type of visual sensibility. There is no doubt that great acuity in the perception of moving objects is a prominent characteristic of the panoramic vision of lower animals, both herbivora and carnivora—probably more in the former than in the latter. There can also be little doubt that in these animals, although vision has already undergone some differentiation and has acquired some epicritic characters, it is essentially protopathic, even if not of the most primitive type. If in man the rods are the organs of protopathic vision we should expect them to exhibit those physiological attributes which, when synthesised with other attributes, permit of the perception of movement. And it is, indeed, found that perception of movement is most acute when the image falls upon peripheral parts of the retina. This is very strikingly demonstrated by the persistence of flicker in the periphery when it has already ceased for the same rate of alternation of stimuli at the centre.[12] We might also expect that in recovery from lesions which abolish peripheral parts of the field of vision the appreciation of movements of objects would be restored before the appreciation of shape or colour. Wilfred Harris,[13] in 1897, pointed out that this was so in cases of transient hemianopia following epileptic attacks, and Riddoch[14] has brought forward still more conclusive evidence derived from war injuries of the occipital lobes. The conclusion which Riddoch draws, which is comparable with Head's tracts of tactile discrimination—viz., that a sensation of movement should be regarded as a primitive function of the peripheral retina, cannot be admitted. Like tactile discrimination, the appreciation of movement is a perception, dependent upon change of local sign, and therefore involves a synthesis of such a nature that the peripheral mechanism alone cannot effect. Striking evidence of the part played by the cortex in the perception of movement is afforded by a case of bilateral lesions of the occipital lobes reported by Pötzl.[15] If a strong source of light was moved slowly or rapidly before the eyes the patient did not seem to apperceive the movement of the object, but interpreted it as several separate lights.

The extreme sensitivity to movement is due to the low stimulus threshold of the scotopic mechanism and its capacity for summation whereby subliminal stimuli surpass the threshold if they are reinforced numerically, either by increase in the area excited or by successive excitation of neighbouring points. In addition to these factors, it is necessary that the response should be of short duration, dying away rapidly under continued excitation. This is indeed a very well-marked feature of stimulation of the peripheral parts of the retina. It is usually attributed to rapid fatigue, but it is very doubtful in my mind whether fatigue, properly so-called, occurs in the retina at all. The rapid fading is much more likely to be due to a form of induction, which produces a refractory period.[16]

The all-or-none reaction of the most primitive form of protopathic sensibility negatives not only gradation, except in so far as this can be accounted for by recruitment, but also adaptation in the sense in which this term is used in physiological optics. Yet in man it has become endowed with both. It shows, however, scarcely any trace of gradation in what is commonly described as "form vision."

PHOTOPIC VISION EPICRITIC.

The photopic mechanism, mediated by the cones of the retina, shows all the characteristics of epicritic sensibility. It is minutely graded, following, like other sensations and most perceptions, the well-nigh universal Weber-Fechner law over all ranges of intensity except the very high and the very low. It is not only thus graded in intensity, but also in extensity, displaying minute discrimination as regards local sign. This is the basis of visual acuity, which in the case of contour displacements may reach the extraordinarily high value that s involved in the discrimination of so low a visual angle as 2″ (Andersen and Weymouth).[17]

Photopic vision also shows the richest qualitative differentiations of any sense, its only competitor being hearing. Whereas scotopic vision is under normal conditions capable only of an undifferentiated "vision brute," photopic vision manifests itself in all the colours of the rainbow and a few more.

But, while photopic vision is pre-eminently epicritic in these higher differentiæ, it also resembles epicritic sensibility in general in retaining the fundamental quality of protopathic vision. The mere untoned brightness or luminosity of scotopic vision pervades every photopic response as a brightness which everyone recognises but which is so difficult to define. Thus, Helmholtz says, "I have the impression that in heterochromatic luminosity equations it is not a question of the comparison of one magnitude, but the combination of two, brightness and colour glow, for which I do not know how to form any simple sum and which I cannot further define in scientific terms." The perceptual pattern is still relatively undifferentiated, and at the lowest intensities it becomes indistinguishable from the protopathic pattern.

For if we study the threshold of vision in the rod-free area of the retina we find that the total quantity of light—i.e., the product of the area stimulated and the illumination—must attain a certain value, and it makes no difference how the quantity and the area are varied so long as the product is the same (Riccò).[18]

Here we have a precise mathematical law, which holds for these most differentiated structures, but does not hold for peripheral retina.[19] Asher found that for the range of light intensities used by him, the apparent size up to a visual angle of 2′–3′ depends entirely upon the quantity of the light. By varying the area and the intensity of the light smaller areas may be made to appear larger than really larger areas. The so-called "magnitudes" of the stars depend upon this fact. Similarly, with regard to colours, Charpentier showed that the chromatic threshold also depends upon the area stimulated. As might be expected, for the more highly differentiated colour-sense, the law associating area stimulated with intensity is not so simple as for white light. Further, as Abney [20] has pointed out, as the intensity of the light is diminished gradually to extinction of the sensation, a coloured square or disc becomes first an ill-defined fuzzy patch of grey and appears finally to depart almost as a point. It appears to me that these liminal stimuli reproduce the characteristics of primitive chaotic sensations, in which size, colour, and other qualities are but little differentiated—in other words, the protopathic sensation.

If Head and his colleagues are correct in saying that the temperature sensations are common to both protopathic and epicritic systems, but differ from the two systems in range, &c., these are comparable to luminosity in protopathic and epicritic vision.

So far as affective tone is concerned it is undoubtedly enhanced in epicritic vision in man, owing to the appreciation of colours. It is, however, probable that the affective tone of protopathic vision in lower animals is much greater than in man; and the affective tone in man is largely the result of higher—conceptual—syntheses, mediated by the complex association system of the cortex.

It has already been pointed out that movement is more readily discerned when the images fall upon the periphery of the retina—i.e., in the eminently protopathic area. It is, however, also mediated by the epicritic system in the macular area. There is, indeed, evidence to show that the physiological factors which have already been described as subserving the perception of movement at the periphery also obtain in less evident degree at the macula. Andersen and Weymouth attribute an important function to movement in the binocular discrimination of depth. As already mentioned, they find the threshold extremely low, corresponding to retinal displacements far less than one cone-diameter. They think that this can be explained by visual stimuli giving rise to a complex percept of position, which they call the retinal mean local sign. At least three factors contribute to this: (1) The mutual effect of adjacent retinal elements in either retina; (2) the averaging of the successive stimulus patterns on each retinal mosaic caused by the constant slight eye-movements; (3) the combining of the two simultaneous stimulus patterns presented to the two eyes. They do not, I think, take sufficient account of induction, whereby the irregularities produced by the irregularly distributed cones are smoothed down by inhibition of the unstimulated or relatively unstimulated neighbouring cones, a function comparable to reciprocal innervation. Moreover, as Sherrington has pointed out, this facilitation of visual acuity is an example of immediate induction. He has found that osmic-stained nerve-fibres of 4 μ diameter are visible to the naked eye. Similarly, just as a moving point in the peripheral field is more visible than a line of similar length, direction, and duration, so a row of dots individually below the minimum visible and too far apart for their retinal images to overlap by diffusion becomes visible. Hartridge also says,[21] "Contours of all kinds are met with to a very great extent in ordinary visual observation, and it would appear that the important phenomenon of simultaneous contrast has been specially developed in order that the appreciation of contours should be facilitated. The narrowness of a contour of which the eye can perceive the existence is therefore a matter of far greater importance in vision than the fineness of a grating or the closeness of two double stars that can just be resolved."

EPICRITIC DIFFERENTIATION THE BASIS OF COLOUR APPRECIATION.

Epicritic differentiation reaches its highest development in vision among all the senses, for upon it depends the appreciation of colours. The study of colour vision, however, shows that, complex as it is, it is by no means as elaborate as the vast range of hues which we can discriminate would lead us to suspect. The late Lord Rayleigh claimed to be able to discriminate between the hues of the two sodium lines, a difference of less than 1 $\mu\mu$ wave-length, and under favourable conditions 150 or more hues can be detected in the spectrum.[22] Newton, however, proved that all these hues and others outside the range of the spectrum (the purples)—in fact, with very few exceptions [23] every perceptible hue—can be reproduced by the mixture of radiations of three wave-lengths suitably chosen. This is a fact of such profound theoretical importance that in my opinion no theory of colour vision is adequate in which it does not play a fundamental and preponderant rôle. Thomas Young first recognised that the totality of physiological activities comprises far fewer elements than the objective stimuli, and that a triplex physiological mechanism, each part of which responds appropriately to spectral radiations, would suffice to explain a vast number of the facts of colour vision, thus reducing the independent variables from an indefinitely large number to three.

It is not my intention here to discuss theories of colour vision. The data in favour of the trichromatic theory are well known, and the arguments against it have been even better advertised. It is clear that if the trichromatic theory is true the explanation of the evolution of epicritic vision from the primitive protopathic form is very much simplified. The theory was founded upon the responses of the eye to mixtures of various light stimuli, and for many years rested upon these facts. Of recent years much confirmatory evidence has been derived from the study of the time relations of the responses. The antagonistic facts were derived chiefly from observations upon simultaneous and successive contrast, and Helmholtz did scant service in attributing these to psychological causes. Recent work has shown that many, if not all, of these facts are elucidated by a better knowledge of induction, and are as much "physiological" as the facts of colour mixture.

One of the most striking and least explicable facts of colour vision is the eliciting of chromatic responses by pure black and white stimuli. The best known method of producing them is by means of Benham's top, though Fechner had already drawn attention to them in 1838.[24] There can be little doubt that the true explanation in its main outline has been adduced by Piéron.[25] It has long been known that the response to a light stimulus is in the form of a wave of sensation, which, with strong stimuli, rises very rapidly to a maximum and then falls at first rapidly, and then more slowly. With weaker stimuli the curve is flattened out:[26] the stronger the stimulus the more rapid both the rise and the fall of the response—according to Piéron both are proportional to the fourth root of the intensity when the cones are stimulated. It has further been shown that the response to red rays * is most rapid, that of violet rays least, and that of green intermediate. When we take into consideration the so-called "hypermaximal phase," the peak of the curve which is the first stage of the response, and the time relations as determined by Broca and Sulzer,[27] the colours observed with Benham's top are completely explained, as shown by Piéron's observations and diagrams. What, however, is not so readily explained is that the colours are only observed in juxtaposition with the black lines, and not over the white surface. Piéron's explanation of this fact is obscure and

* This inaccurate terminology is used for the sake of brevity.

unsatisfactory.† It is probable that the true explanation depends upon reciprocal induction.

By means of a rotating sector or episcotister Charpentier and others have studied the duration of the visual response to a flash of light. The criterion of duration is the critical frequency of alternation of light and dark—i.e., the point at which flicker disappears. When the durations for individual wave-lengths of a spectrum are plotted as ordinates against the wave-lengths as abscissæ, a curve is obtained which is called a "persistency curve." Since the duration varies inversely with a function of the brightness—as proved for a very wide range of intensities by Porter, and confirmed by innumerable observers since [29]—the lowest part of the persistency curve corresponds to the brightest wave-lengths—i.e., lower points mean greater brightness. Obviously, too, if the reciprocals of the durations are plotted against the wave-lengths we obtain the luminosity curve of the spectrum. In fact, flicker photometry is now recognised as the most accurate method of heterochromatic photometry.

ALLEN'S RESEARCHES ON "FATIGUE."

By investigating the effect of so-called "fatigue," with spectral colours upon the persistency curve, Frank Allen,[29] professor of physics at Winnipeg, has discovered a number of facts which are of great importance to the theory of vision.

[The lecturer here entered into the subject of Allen's researches in considerable detail, and finally summarised them as follows:—]

(1) Stimulation of one area of a retina with light causes—

(*a*) *Direct effects* upon that area.

(*b*) *Induced effects* in all other areas—i.e., both in the same eye and in the other eye.

(2) *Direct Effects.*—With both eyes in a condition of moderate photopia:—

(*a*) Stimulation with white light depresses the sensitivity throughout the spectrum.

(*b*) Shading the eye also depresses the sensitivity throughout the spectrum.

(*c*) Stimulation with any given wave-length depresses the sensitivity to this region of the spectrum and enhances it for the complementary colour.

(*d*) With any given wave-length the depressions and enhancements show three curves affecting respectively the red, green, and violet.

(*e*) Stimulation with the equilibrium colours—660 μμ, 570 μμ, 520 μμ, 505 μμ, 480 μμ, 425 μμ—has no apparent effect upon the sensitivity of the visual apparatus.

(3) *Induced Effects.*—With both eyes in a condition of moderate photopia the effects on the unexcited areas of the same and the opposite retina are:—

(*a*) Stimulation with white light enhances the sensitivity throughout the spectrum.

(*b*) Shading an area or an eye depresses the sensitivity throughout the spectrum.

(*c*) Stimulation with any given wave-length enhances the sensitivity throughout the spectrum, the enhancement being most marked in every case in the red, green, and violet.

(*d*) Stimulation with any given wave-length enhances the sensitivity most for the complementary colour.

(*e*) Stimulation with the equilibrium colours has no apparent effect.

As the result of Allen's researches we are able to envisage more accurately the phenomenon of induction. As he has pointed out, they serve to prove most conclusively the physiological—as opposed to transcendental psychological—foundations of contrast. They explain on purely physiological grounds many of the greatest difficulties associated with contrast, such as the divergence from the precise complementary in induced colours (p. 952),[30] changes in hue and saturation after prolonged fixation (p. 933),[30] coloured shadows (p. 936),[30] the "memory colours" of Hering (p. 938),[30] the Ragona Scina experiments (p. 375),[31] some of Abney's experiments (p. 379),[31] binocular contrast (p. 381),[31] Fechner's paradox (p. 609),[32] Bidwell's experiment (p. 618),[32] and some of Edridge-Green's observations (p. 620).[32]

The facts at our disposal do not render an exhaustive discussion of the elementary physiological processes occurring in the receptors, conductors, and synapses very profitable. The only firmly established fact is that visual purple is the physico-chemical substratum of scotopic vision, and hence it is natural to have some predilection for thinking in photo-chemical terms.

CONDUCTION OF VISUAL IMPULSES.

When one comes to conduction of the visual impulses, there is no good ground for imagining that it is different from the conduction of nervous impulses in other nerves. If that be so, the all-or-none character of the response discovered by Adrian and Keith Lucas holds good. The theory of recruitment for the explanation of the graded muscular response to different intensities of stimulation in motor nerves, whereby increased intensity increases the number of nerve fibres stimulated and of muscle fibres responding, meets with difficulties in the case of tactile and visual responses. As already mentioned, it may suffice to explain some of the effects in the scotopic mechanism, but it is not easy to apply it to the single cone bipolar mechanism of the epicritic system.

[Instances of inhibition in visual phenomena were alluded to, especially those of binocular and monocular struggle elucidated by McDougall's work.]

Turning now to the anatomical basis of the lower visual impulses, have we any knowledge or can we reasonably conjecture the structures which mediate the conduction and central connexions of the protopathic and epicritic systems? As is well known, the afferent visual paths from the retina in the optic nerve and tract pass to three so-called primary visual centres—the lateral geniculate body, the pulvinar of the optic thalamus, and the superior colliculus. Of them, those passing to the colliculus are undoubtedly the most primitive phylogenetically, since they are a residuum representing the survivors of practically the whole of the afferent visual fibres in lower animals, which pass to the tectum. Here they form the superficial layer of fibres, and are brought into relation with the bulbo- and spino-tectal fibres. There is no doubt, therefore, that in these animals, going down as low as the cyclostomes, the function of these optic fibres is almost entirely photostatic, and that they are protopathic. The tectum shows histological differences in mammals from the condition in lower vertebrates. The optic fibres are reduced in number and are situated below a layer of nerve cells, and therefore less superficially. Moreover, the efferent cells are raised and somewhat approximated to the optic fibres. These efferent cells send axons to the retina (tect-optic fibres of Ramon y Cajal and v. Monakow) and to the tecto-bulbar tracts. Kappers attributes this approximation to neurobiotaxis, and sees in it an expression of the predominantly reflex function of the optic fibres. "Optic reflexes in mammals are certainly not fewer, but in the primates are much finer than in lower animals."[33] The tectum receives no macular fibres, and has no cortical projection. We may conclude, therefore, that the optic fibres to the superior colliculus in man are protopathic.

There is good reason to think that the great majority of retino-geniculate fibres carry the impulses of the epicritic system, but that those which pass to the ventral nucleus are protopathic.

In primates, and especially in man, some of the optic nerve fibres, both crossed and uncrossed, pass to the pulvinar of the optic thalamus. This increase in the dorso-lateral part of the thalamus is associated with the adoption of the erect posture. It is a correlation area, receiving besides the visual fibres also fibres from the anterior peduncle of the cerebellum (Horsley and Clarke) and the red nucleus (Sachs). It is in near

† Lorsqu'une petite surface rétinienne n'est pas, ou n'est que faiblement excitée au voisinage d'une région qui est le siège d'un processus lumineux et chromatique, l'excitation de cette surface par diffusion comporte une prédominance des processus chromatiques, qui se propagent avec une intensité plus grande que le processus lumineux."

relation with the thalamo-cortical fibres to the arm region of the pre-central convolution, and its development is probably related to the increased importance of the hand and fingers as organs of exploration (Kappers). It may therefore be regarded as a "centre" for the correlation of eye and hand, and therefore of the utmost importance in stereognosis. This view is strongly supported by the fact that the pulvinar has an extremely rich cortical projection to the angular gyrus. There can be no doubt, therefore, that the retino-pulvinar fibres belong to the epicritic system.

It is easy to correlate these anatomical deductions with the vital import of the reflexes which are chiefly dependent upon protopathic vision, and with the gnostic import of visual sensations which are chiefly dependent upon epicritic vision. It is more difficult, and perhaps in our present state of knowledge impossible, to correlate them with the relatively feeble, but still very appreciable, gnostic import of scotopic vision.

I have built up the argument in this thesis chiefly on the known facts of visual sensations in man, in whom alone we have immediate knowledge of them. The visual organs of lower animals might be expected to afford a vast amount of evidence for or against the theory. It must be freely admitted that the evidence from this source, in the present state of our knowledge, is very ambiguous. Nor should this, indeed, be unexpected. Light-responsive organs are found in nearly all moving animals, including many of the lowest invertebrates. There is, it is true, a remarkable uniformity in the general plan of the structure of the receptor cells; but it is a uniformity which characterises all sensory receptor cells. The mosaic eyes of insects show that it is possible to have a visual organ built on so different a plan from the mammalian eye that scarcely any analogy can be drawn between them.

Confining ourselves to vertebrates we find great diversities within a common type. Speaking teleologically, this was inevitable. Adaptation to terrestial life necessarily involved changes in the visual apparatus, life in the air yet other changes. But, apart from these gross adaptations, each species has become specially adapted to a particular environment and mode of life. In these adaptations vision, whilst nearly always retaining an important rôle, has not necessarily been the predominant sense. It cannot be too forcibly insisted that all the facts of perception are biologically determined. An exhaustive investigation of the correlation of the various senses in different animals could not fail to elicit facts of profound physiological and psychological importance. The most cursory observation of their habits and anatomical structures reveals striking differences, such as the lateral line system in fishes, the colossal lobus visceralis associated with taste in certain fishes, the great development of the trigeminal in cyclostomes, some birds (ducks and geese), the crocodile, &c., the high development of smell in monotremes, dogs, and so on. As is well known, the cortex cerebri was built up upon the basis of the sense of smell, to be replaced only later by a neopallium built up upon the basis of vision, to which man owes his supremacy. Hence the position of the primates is peculiar, and analogies which might well be expected to obtain among them are scarcely to be looked for between them and species of a totally different mode of life.

Moreover, investigations of the vision of lower animals are extremely difficult and have led to very untrustworthy results. We have no certain knowledge of the range of spectral radiations to which lower animals respond, nor the modes of their reactions. The experiments of Hess and others,[34] elaborate and interesting as they are, have led only to tentative conclusions.

The most promising field of investigation from the present point of view is the structure of the retina in vertebrates. The duplicity theory originated in the observations of Max Schultze and Parinaud on the neuroepithelium of diurnal and nocturnal animals. Greeff[35] found that there are rods and cones in the retina of most mammals, amphibia, and fishes, the number of the rods much exceeding that of the cones. In birds cones are much in excess of rods. In most reptiles (lizards, snakes, tortoises) only cones are found; diurnal saurians have no rods, nocturnal no cones (Rochon-Duvigneaud). There are vertebrates possessing only rods—e.g., amongst fishes, rays and dog-fish; amongst mammals, hedgehog, bat, mole, and night-ape (*Nyctipithecus felinus*). There are also animals of nocturnal habits possessing only rods. Owls, mice, and rell-mice have only a few rudimentary cones; rats also possess a few cones. Hess found rods in fowls and pigeons, though they are scanty in the posterior and superior parts of the retina, which are most used in pecking.

So far then the observations seem to confirm the thesis set forth above. But if one investigates the subject more closely doubts arise. It is by no means easy—indeed, it seems to be impossible—to find any definite criterion as to what is a rod and what a cone. The foveal cones in man, for example, are in no sense conical, but resemble elongated rods—and these are the organs of "cone" vision par excellence! The extreme ambiguity is shown by Putter's[36] morphological classification:—

I. Outer limb cylindrical.

(*a*) Inner limb cylindrical. (1) Foot-piece knobbed—e.g., "rods" of rat and selachian fishes. (2) Foot-piece branched—e.g., "rods" of sparrow, "cones" of macula of men.

(*b*) Inner limb swollen: (3) Foot-piece knobbed—e.g., "rods" of man. (4) Foot-piece branched—e.g., "cones" of pigeon.

(*c*) Inner limb filamentous: (5) Foot-piece knobbed—e.g., "rods" of perch, esox, chondrostoma. (6) Foot-piece branched—e.g., green "rods" of frog.

II. Outer limb conical.

(*a*) Inner limb cylindrical: (7) Foot-piece branched—e.g., "cones" of fovea of sparrow, "rods" of siredon.

(*b*) Inner limb swollen: (8) Foot-piece branched—e.g., peripheral "cones" of man and birds, "cones" of many fishes, &c.

III. Outer limb filamentous.

(*a*) Inner limb cylindrical: (9) Foot-piece branched (?)—e.g., "cones" of esox.

(*b*) Inner limb swollen: (10) Foot-piece swollen—e.g., "cones" of siredon.

An examination of our present knowledge of the comparative histology of the retina is disappointing, and we must await further information before much help can be derived from this source.

In conclusion, though there is much in this thesis which is speculative, the speculation is of that type for which the term hypothesis should be reserved—i.e., it is that form of speculation which is submissible to experimental verification and elaboration—the only form of speculation which is of scientific value. What I wish specially to emphasise is the view that increased knowledge of the psychology of perception, in which in man vision plays a predominant part, must depend upon increased knowledge of the physiology of the special senses. And further, that the advance of ophthalmology also depends upon increased knowledge of the physiology of the eye and of vision. Ophthalmology, in my opinion, has too long been content merely to apply past knowledge. The future advance in the treatment of cataract, for example, will not, as heretofore, consist in new refinements of technique, but will be revolutionised by the biochemistry of the lens. Let us take to heart this great lesson, perhaps the most important lesson taught by the life and work of Sir William Bowman, the master whom we venerate to-day.

REFERENCES.

1. See Koffka: The Growth of the Mind, London, 1924.
2. Die vergleichende Anatomie des Nervensystems der Wirbeltiere und des Menschen, i., 111, Haarlem, 1920.
3. Das Sehen der niederen Tiere, Jena, 1908.
4. Brain, August, 1924.

(*Continued at foot of next page.*)

THE NASAL SINUSES AS A ROUTE OF INFECTION IN ENCEPHALITIS LETHARGICA.

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I. BY MR. LOWNDES YATES.

IN inflammatory conditions of the nasal mucous membrane we are able to recognise four main types of inflammation—namely, Type 1, where the secretion consists of clear mucus, and the cilia are either active or are fatigued by the additional work necessary to remove the mucus, if this is more viscid than normal. Type 2, where the condition is similar to the above, but the inflammation is of a higher degree, with the result that serum and leucocytes are mixed with the mucus, which is then known as muco-pus. Type 3, in which the mucus is altered by fermentation as a result of the number of micro-organisms present within it, so that it is thin and partially toxin-permeable, as a result of which bacterial toxins reach the mucous membrane, causing congestion of this, particularly in the regions of the ciliary tracks. Type 4, in which the mucous membrane is pale, the ciliary action is paralysed, the mucous secretion absent or represented by a thin whitish coagulum or by fluid material, and in which the heightened absorption in cases in which the physical conditions favour the retention of fluid for a period of 20 minutes or so, may be demonstrated by the use of indigo-carmine solution.

Heightened Absorptive Power of the Damaged Mucous Membrane.

In an examination of 23 cases of encephalitis lethargica this type of inflammation has been found in or around the opening of the sphenoidal sinus in all.

(*Continued from previous page.*)

5. Instinct and the Unconscious, pp. 31–32, Cambridge, 1920.
6. See Parsons: Introduction to the Study of Colour Vision, p. 215, 1924.
7. See Parsons: Trans. Ophthalm. Soc., xli., 97, 1921.
8. Cf. Parsons: Nature, cx., 824, 1922.
9. Sherrington: Loc. cit., p. 329.
10. See Parsons: Colour Vision, pp. 76–78.
11. Loc. cit., p. 73.
12. See Parsons: P. 108.
13. Brain, xx., 307, 1897.
14. Brain: xl., 15, 1917.
15. Wiener klin. Wochenschr., 1911, xxiv., 518, cited by Wertheimer; Zeitschr. f. Psychol., 1912, lxi., 247.
16. On the Perception of Movement, see Wertheimer, loc. cit., p. 161.
17. Amer. Jour. of Physiol., lxiv., 561, 1923.
18. Parsons: Loc. cit., p. 130.
19. Parsons: Loc. cit., pp. 56, 136.
20. Researches in Colour Vision, p. 177, London, 1923.
21. Jour. of Physiol., lvii., 59, 1922; see also Phil. Mag., xlvi., 49, 1923.
22. Parsons: Loc. cit., p. 33.
23. Loc. cit., pp. 28, 39.
24. Parsons: Loc. cit., p. 101.
25. L'Année Psychol., xxiii., 1923.
26. Parsons: Loc. cit., pp. 94, sqq.
27. Jour. de Physiol., iv., 632, 1902; Comptes rendus de l'Acad. des Sci., cxxxvii., 944, 977, 1046, 1903.
28. Parsons: P. 102.
29. Physical Rev., xi., 257, 1900; xv., 1902; xxviii., 45, 1908; Trans. Royal Soc. of Canada, ii., 195, 1909; Phil. Mag., xxi., 604, 1911; xxxviii., 55, 81, 1919; Jour. of the Optical Soc. of Amer., vii., 583, 913, 1923; viii., 275, 1924; ix., 375, 1924; see also M. S. Hollenberg, ibid., viii., 713, 1924.
30. Jour. of Optical Soc. of Amer., vii., 1923.
31. Ibid., ix., 1924.
32. Ibid: vii., 1923.
33. Kappers: Loc. cit., p. 902.
34. See Parsons: Loc. cit., p. 144.
35. Ibid., p. 14.
36. In Graefe-Saemisch, Hdb. d. ges. Augenheilkunde, ii., 1, chap. x.

The significance of this fact had escaped my attention until it was pointed out by Dr. Stanley Barnes, who suggested that the heightened absorptive power of the mucous membrane in these cases afforded an explanation of the manner in which the filter-passing virus reached the tissues. It follows from this, if the above hypothesis is correct, that only such members of the community as suffer from this type of rhinitis or sinusitis in this region of the nose are potential subjects of this disease, and that it is necessary for the passage of the disease from one individual to another that the air-borne and filter-passing virus of encephalitis lethargica should fall on soil previously prepared by inflammation which has resulted in the alteration of the normal mucous membrane to that of sinusitis or rhinitis, with total or subtotal paralysis of the cilia and of the mucous secretion; such alteration having been produced either as a result of a chronic rhinitis or as a result of a single heavy infection of the nasal mucous membrane of the type known colloquially as influenza. In patients who have developed encephalitis lethargica after suffering from a chronic and intense rhinitis for some years, bacteriological examination in almost all cases has demonstrated the presence of either the bacillus of Friedländer or of the pneumococcus, and the well-recognised chronicity of the nasal infection when these organisms are present affords an explanation of the occurrence of type 4 sinusitis in these cases, while in a few cases other organisms were found. In those cases in which a history of an acute or influenzal rhinitis was present, cultivation of the contents of the sphenoidal sinus revealed the presence of the *Staphylococcus aureus* together with the pneumococcus, while in one case hæmolytic streptococcus was found; and it is thought that the well-known proteolytic power of these micro-organisms explains, by the assumption that they have a similar proteolytic power on mucus, the rapidity of the change in the mucous membrane, the inflammation in which is of such intensity that it passes from that of the mucous membrane with normal reaction to that of a type 4 rhinitis within the space of a few days or even hours.

With regard to the finding of the *Staphylococcus aureus* in a high percentage of cases of encephalitis lethargica occurring after rhinitis of the influenzal type, it should be noted that we have only lately found the cultural methods which we have employed slightly favour the growth of this organism, and the observations will therefore have to be repeated. The normal nose by similar bacteriological methods is sterile. If scales of mucus are dry sterilised, dissolved under sterile conditions, and kept at room temperature, the solution retains its colloid character almost indefinitely, but if mixed with a large quantity of living staphylococci it is rapidly autolysed. Small quantities of staphylococci mixed with the mucus appear to die. If the mucus is inadequately sterilised rapid autolysis occurs, which suggests that other organisms besides the staphylococcus can destroy the mucus.

The heightened absorptive power of the mucous membrane can be demonstrated in type 4 sinusitis by injection of either solutions of indigo-carmine or of phenol-sulphone-phthalein into the sinuses, when it will appear in the urine, taking about twice as long to do so as if it were injected into a muscle, but not appearing in the urine in cases of sinuses lined by relatively normal mucous membrane.

Of the 23 cases of encephalitis lethargica examined, seven gave a history of acute rhinitis following sinus pain, generally associated with some degree of ill-health.

From the above considerations it would appear that in the cases of encephalitis lethargica examined, the mucous membrane in and around the region of the sphenoidal sinus had undergone alterations of such a nature as to diminish the secretion and greatly increase the power of absorption from it. Such a condition would facilitate the passage of a filter-passing organism,

and it appears probable that the virus of encephalitis lethargica can enter the tissues with greater readiness when such a condition is present, and therefore this may be a necessary precursor of the disease. It is, however, not possible to speak definitely on this point until this hypothesis has undergone the test of time.

In cases where disease is no longer active but is slowly progressing, the washing out of the sphenoidal sinuses and filling them with eucalyptol paraffin appears at times to effect a marked improvement, but has no effect whatever upon such symptoms as are due to brain lesions. It does appear, however, in practically all cases to prevent recurrences, while in more acute cases the use of eucalyptol paraffin within the nose is well worth a trial alone or combined with washing out the sphenoid.

I am indebted to Dr. G. Eden, of the Queen's Hospital and Hospital for Nervous Diseases, Birmingham, for the provision of much clinical material on which this report is based, and to Dr. R. B. H. Wyatt, bacteriologist to the University of Birmingham, for the bacteriological examination and cultivation of material removed from the sinuses.

II. NOTE BY DR. STANLEY BARNES.

The research which Mr. Yates has carried through so successfully and recorded above is of vast interest to those of us who are concerned with the paths of infection to the central nervous system. More particularly it has been puzzling to determine how the various facts which are known with regard to encephalitis lethargica can be assimilated into a reasonable theory which will explain the path of infection in this disease. It will be remembered that Levaditi found that the mucous secretions from the mouth in cases of encephalitis were often pathogenic, whilst, as a rule, the salivary duct secretions were not so; again, it has been pointed out many times that certain individuals are carriers of the filter-passing organism, but have themselves shown no sign of the disease. Another fact which must be coördinated with the theory in order that the latter may be accepted is the close association with the epidemic of influenza which started in 1917.

Post-Influenzal Rhinitis as a Precursor of Encephalitis.

Now, it has to be remembered that the latter has been associated throughout its course with several types of the catarrhal group of micro-organisms, and that many cases of encephalitis whose nasal secretions have been examined have been found to be carriers of one or other of this group of bacteria. It is thus probable that after an attack of the severe type of influenza which has occurred within recent years, a certain number of people have suffered from chronic nasal disease of the type which Mr. Yates has been describing; and if these cases of post-influenzal rhinitis had been thoroughly examined, it would be found that one or more of their accessory sinuses were inflamed in accordance with type 4 as described by Mr. Yates. It is clear from his researches that certain toxins and chemical substances, such as indigo-carmine, can pass through the mucous membrane in this condition, whereas the normal mucous membrane of the sinuses is capable of preventing the access of any organism or toxin. It is thus probable that the filter-passing organism of encephalitis when absorbed into the nasal cavity of a normal individual gives rise to no symptom, but when it gains lodgment in the nose of a sufferer from type 4 sinusitis it may pass through the mucous membrane and be absorbed into the deeper tissues. This theory would thus account for the absence of nervous symptoms in those who show the presence of the organism in their naso-pharyngeal secretions, and for the great difficulty which has been experienced in tracing the infection from individual to individual; for it is clear that the rule would be that there should be far more carriers than sufferers, seeing that the organism would be spread by coughing or sneezing and be air-borne, and would only give rise to signs of encephalitis in those who also suffered from the most severe or fourth degree of sinusitis.

Path of Infection.

As to the path by which the organism reaches the central nervous system from the sinuses, it is more than likely that it does not pass by the blood-stream, but does pass by the peri-neural lymphatics along the branches of the first division of the fifth nerve and so reaches the brain. If this is correct it would also explain why so many of the cases have shown evidence of damage to the mesencephalon and pons Varolii, seeing that the ascending root of the fifth nerve is likely to carry the infection close to the ocular nuclei and the mesencephalic structures.

It has been impossible locally to confirm this theory of the mode of infectivity in encephalitis, but it fits in with so many of the observed facts that I feel certain that this is the mode of infection. I would suggest that those who have an opportunity should not only investigate the condition of the various sinuses in cases of death from encephalitis, but should also attempt to trace the organism in the first division of the fifth nerve and the corresponding portion of the Gasserian ganglion on the same side as any sinus lesion. It is possible that the olfactory nerves also act as channels for the absorption of the virus in some instances, and the olfactory bulbs might with advantage be investigated in the same way as the Gasserian ganglion.

It should be remembered in this connexion that the toxin of tetanus has been proved to be carried to the central nervous system from the peripheral focus along the nerve sheaths, so that there is every reason to believe that other organisms may give rise to infection in the same way.

Arguments on similar lines may be applied to the absorption of micro-organisms from the nasal sinuses in cerebro-spinal fever. The work of Orr and Rows showed experimentally that cocci tended to track along the spinal roots centripetally to the cord and give rise to meningitis or to myelitis. Given the original damage to the nasal mucous membrane, which is characteristic of type 4 sinusitis, such a process is likely to occur in cases where nasal infection by the meningococcus is superadded; and a tracking along nerve sheaths (twigs of the first division of the trigeminal, or branches of the olfactory) is theoretically more likely to be the path of infection than an emissory vein.

In a recent communication Behr has shown that it is likely that the infection in certain cases of disseminated sclerosis commences in the posterior ethmoidal sinuses and passes from them to the optic nerves. Here is another instance in which it is possible that a preliminary damage of the type described by Mr. Yates as type 4 sinusitis is necessary before the infective agent can pass through into the nervous system. It is realised that at this stage no decision can be reached as to the exact pathology of disseminated sclerosis beyond the fact, which is fairly established, that there is an invasion of the nervous system by some parasite; nevertheless, the large number of cases in which preliminary histories of nasal catarrh are almost the only predisposing factor in otherwise healthy young adults who develop disseminated sclerosis is of itself a strong reason for believing that there must be some causal connexion between the two.

Summary.

It is thus suggested that the infection in encephalitis (and possibly other central nervous infections) is a symbiotic process; that in the first place the nasal mucous membrane is damaged by one of the catarrhal group of organisms, and that subsequently the virus of encephalitis is inhaled, passes through the damaged mucous membrane, and is absorbed into the brain via the peri-neural lymphatics.

A CASE OF
BILATERAL PREPATELLAR BURSÆ.

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THE following case of bilateral prepatellar bursæ presents some unusual and interesting features.

The patient, aged 54 years, was a charwoman who had done a considerable amount of work on her knees for the last 35 years, sometimes doing five hours' continuous work in that position. The right bursal swelling had been present for ten years and the left for six, increasing in size very gradually. They had never caused her much inconvenience, and she only had pain for about ten minutes after starting to kneel; when this had passed away she could kneel for hours without discomfort. When the bursæ were small she used to kneel on them with the anterior surface touching the floor, but latterly they projected so that the inferior surface came into contact with the floor. The skin covering this surface became abraded and septic, and she sought medical attention on this account. There was no limitation of movement at the knee-joints and the patient could move quite briskly. She had some difficulty in stooping and bending from the waist. The right bursa projected about 3–4 inches. It was hard and no fluctuation could be obtained. It was intimately connected with the patella and could only be moved from side to side with that bone. The left projected 3 inches; it was softer than the right, and fluctuant. It also could only be moved with the patella. The skin was abraded over the inferior surface. An idea of the shape and size of the bursæ may be obtained from the accompanying photograph.

Bilateral prepatellar bursæ.

The bursæ were removed by transverse incisions across the joints, the flaps of skin in the left being so arranged that the septic portion was removed. The bursæ were intimately connected with the underlying fascia, with which the fibrous tissue of their walls was continuous. This had to be divided. The wounds healed by first intention.

After removal the size of the right was 7 cm. long, 7·5 cm. deep, and 9 cm. across. The left was 7·5 cm. long, 7 cm. deep, and 6·5 cm. across. On section the cavity in the right was found to be 4 cm. in diameter, the rest of the swelling consisting of extremely hard and avascular fibrous tissue. The cavity contained some blood-tinged serous fluid and was intersected by thin fibrous trabeculæ. Its walls were ragged and breaking down, and there was no sign of serous membrane to be seen. The cavity in the left was larger than that in the right (5·5 cm. across), and occupied a deeper position. The walls were also ragged in places and similar trabeculæ intersected the cavity. The fibrous tissue was not so thick nor so dense. The skin over the summits of the bursæ was fairly thick, varying from about 0·25 to 0·5 cm. A microscopical section showed that the walls consisted entirely of closely-packed fibrous tissue with very few blood-vessels.

It is noteworthy that the older and larger of the two bursæ was the right. The cavity was smaller, the fibrous tissue thicker and denser on that side. The patient was right-handed and stated she always realised putting more strain on the right knee when scrubbing.

I am indebted to Mr. C. D'Oyly Grange for permission to publish the case.

Reviews and Notices of Books.

PSYCHOLOGY OF THE PRE-SCHOOL CHILD.

By BIRD T. BALDWIN, Ph.D., Research Professor in Educational Psychology and Director of the Child Welfare Research Station in the State University of Iowa; and LORLE I. STECHER, Ph.D., Research Assistant Professor in the same station. London and New York: D. Appleton and Co. 1924. Pp. 305. 8*s.* 6*d.*

THIS book describes a systematic attempt to do for the mentality of the child of pre-school age what the child welfare movement is doing for his physical development. It necessarily contains accounts of investigations rather than practical educational suggestions, which can only follow upon further inquiries on these or similar lines. The results of a series of day-to-day observations and measurements from a large and varied selection of tests extending over a period of one to three years on a group of 105 children are recorded in detail. The children ranged from 2 to 6 years of age and were in attendance at the Child Welfare Research Station, Iowa. Certain physical measurements of growth were made, including roentgenograms of the carpal bones and the teeth, but the work was predominantly psychological. The tests employed included, besides scales of general intelligence, numerous measures of motor control and coördination, and certain practical perceptual and associational tests, such as the Knox cubes, Goddard's adaptation test, and Healy's picture-completion. Many are already well known, but results of trials on so young children have not been often recorded; other new tests were also applied, some of which showed considerable originality. The experiments to record the development of the senses of number, time, rhythm, and design are particularly valuable, both as tests and as means of education. The authors have throughout endeavoured to combine educational value with their investigations, and they maintain that it is a mistake to allow a child's mind to grow naturally. To deprive a little child of the instruction it craves is, they believe, to withhold the conditions of normal mental development. Definite conclusions regarding early mental development are not justified from observation of so small a number of cases, and in any case results of the application of tests made under artificial conditions require to be supplemented by the daily study of children under natural conditions by a trained observer, on the lines set out by Sully.

The book, while primarily of interest to teachers of nursery schools, deserves the attention of child welfare medical officers who wish to study the mentality as well as the physique of their subjects.

LECTURES ON DYSPEPSIA.

By ROBERT HUTCHISON, M.D., F.R.C.P., Physician to the London Hospital and to the Hospital for Sick Children, Great Ormond-street. London: Edward Arnold and Co. 1925. Pp. 176. 5s.

THE writings of Dr. Robert Hutchison always possess a charm which makes them especially welcome; moreover, the author's long experience and critical outlook equip him for the difficult task which he has undertaken in the present volume. The lectures are not all equally informative. The essay on the Diagnostic Significance of Abdominal Pain and on the Chronic Abdomen, and the sections dealing with Organic Diseases, such as peptic ulcer and carcinoma of the stomach, are excellent, but, when Dr. Hutchison reaches the crux of the problem of "dyspepsia"—namely, what, in Lecture VII., he terms the functional dyspepsias—his conclusions are so vague that we doubt whether new light is shed on the indefinite and numerous group of sufferers there dealt with. Can any writer do more at the present day? We doubt it, but Dr. Hutchison has specifically set out to lecture to students on "dyspepsia" and, if this symptom is to be retained in a prominent position in medical nomenclature, it seems desirable to obtain more justification for its use than is here given.

Any disappointment which we may feel on this score is enhanced by our admiration for Dr. Hutchison's concluding lecture on the Chronic Abdomen. This address deserves recognition as a classic, but the tragic pictures described so brilliantly will only disappear when the profession has more insight into the obscure beginnings which are dealt with in earlier chapters.

INFECTION, IMMUNITY, AND INFLAMMATION.

By FRASER B. GURD, B.A., M.D., C.M., Lecturer in Applied Immunology and in Surgery, McGill University. London: Henry Kimpton. 1924. Pp. 329. 25s.

THE author believes that sufficient data regarding the phenomenon of tissue hypersensitiveness and its companion state, tolerance, have been accumulated to justify their application in medicine and surgery. He gives a clear and readable account of the phenomena of immunology which should appeal to the practising physician and surgeon for whom the book is written. If at times his explanation of certain of the tissue reactions to infection seems unduly simple and dogmatic, this is probably a fault on the right side. It may be doubted whether our knowledge of immunology is so advanced that treatment on these lines can be said to have left the experimental stage. But this book is at least a worthy attempt to introduce scientific conceptions into therapeutics, and so deserves attention.

HISTO-BIOLOGY OF THE SKIN.

Lectures on the Histo-Biology of the Skin, and Its Diseases. By Dr. JOSEPH KYRLE, a.o. Professor of Dermatology and Syphilology at the University of Vienna. Vol. I. Vienna and Berlin: Julius Springer. 1925. With 222 mostly coloured illustrations. Pp. 345.

THOSE who have had an opportunity of attending Prof. Kyrle's histological lectures will rejoice at the incorporation of 35 of them in a readable volume, admirably and profusely illustrated by a well-known artist. In the preface it is modestly suggested that these lectures may be helpful to such students as may require a general knowledge of cutaneous histology, but dermatologists will agree that the work should be placed in a much higher category than that claimed for it by the author. In his lectures on normal histology Prof. Kyrle has a happy knack of combining a detailed description of form, with an interesting, if somewhat dogmatic, dissertation on the associated physiological functions of the various structures in the skin. This is a new and agreeable departure which should do much to obviate the lack of enthusiasm generally felt for the study of a rather prosaic subject. The volume is divided into six unequal parts. They include: (1) A description of the histology of the normal skin, (2) pigment anomalies, (3) atrophic and (4) hypertrophic disturbances, (5) mycelial infections, (6) effects of parasitic invasion. There is a short index of authors' names, and a good subject-index. The illustrations are among the best and most accurate that have ever appeared in a work on cutaneous histology, and in virtue of their faithful reproduction of important features, the number and variety of stains employed, and the careful selection of the material for biopsy, may long defy the emulation of other histologists in this field.

Dermatologists will welcome this fresh proof of Prof. Kyrle's ability and will look forward to the appearance of subsequent volumes.

HEALTH AND PSYCHOLOGY OF THE CHILD.

Edited by E. SLOAN CHESSER, M.D. London: Wm. Heinemann. 1925. Pp. 302. 7s. 6d.

Dr. Sloan Chesser may be congratulated on having provided a book of real and big interest. Uniformity of outlook is not to be expected in a work of this kind, and it must be admitted that the majority of readers will hardly synthesise the material presented to them into a working scheme of child management, while some may be rather bewildered by the diversity of the factors which are represented as conditioning the development of the child. But as a collection of essays written from widely different points of view by authors who are well qualified to represent them, it should achieve considerable success, and will stimulate the interest of almost every reader in some aspect of the subject which will be new to him. The variety of the subject-matter may be indicated by mentioning a few chapters: Dr. E. Pritchard deals with the psychology of infancy and Dr. H. C. Cameron with want of appetite in children: the development of self-consciousness is discussed by Dr. J. A. Hadfield, the influence of endocrines and vitamins by Dr. Leonard Williams, and delinquency in children by Dr. A. F. Tredgold.

The book is clearly and attractively written, and may be recommended to all who are interested in problems of childhood.

ORGANIC CHEMICAL ANALYSIS.

A Student's Manual of Organic Chemical Analysis, Qualitative and Quantitative. By JOCELYN FIELD THORPE, C.B.E., F.R.S.; and MARTHA ANNIE WHITELEY, O.B.E., D.Sc. London: Longmans, Green and Co. 1925. With diagrams. Pp. 250. 9s.

THIS book is divided into eight sections, the first two of which are devoted to the detection of elements in organic compounds and the methods of purification of organic compounds before analysis. Then follows a section on the ultimate analysis of organic compounds in which the historical development of the subject is traced by a description of the original methods devised by the earlier workers in this field of organic chemistry. Full particulars are given for carrying out the experiments and references are quoted, so that the student is encouraged to look up original papers for himself. The fifth section, which is the longest, will also be found to be the most generally useful, containing as it does the methods of detection and estimation of all the commoner radicles met with in organic compounds, together with a number of practical applications of these methods to the estimation of some compounds of technical importance such as methyl alcohol and formaldehyde. The sixth section contains some practical hints for the systematic examination of complex organic compounds, and there is also an appendix dealing with the methods of micro-analysis.

The book forms a useful addition to the literature of the subject.

JOURNALS.

JOURNAL OF INDUSTRIAL HYGIENE. May, 1925.—The principal article is by E. L. Collis, and deals with the coal-miner, his health, diseases, and general welfare. It is of some interest at the present moment when the mining industry is engaging much attention. The habits of the miner with regard to food, drink, and baths are considered; his methods at work; his occupational diseases, nystagmus, beat-knee, beat-hand, and beat-elbow; his tendency to accidents; his exposure to dust—are all summarised; his social environment in regard to welfare schemes and fertility is discussed, and the relation of unrest on the different coal-fields to the prevailing mortality is pointed out. The conclusion is arrived at that the mind of the miner is affected by such things as those dealt with and expresses itself in a tendency to strike.——June, 1925. The results of two years' ophthalmology in an American manufacturing plant are set forth by H. P. Davidson, who, after 4000 consecutive examinations, found 28·5 per cent. of the men with normal vision in both eyes and 38·9 per cent. with normal vision with lenses; but among the rest there was an appalling number of amblyopias, maldevelopments, and old injuries. The findings are carefully tabulated. The writer is emphatic on the need of education to induce men to wear goggles to prevent injuries and to seek advice for their children.—The health hazards of garages are pointed out by G. M. Burnham to be considerable. Acute and subacute poisoning from carbon monoxide in exhaust gases is an ever-lurking danger. The tendency to enrich fuels with cracked petroleum, coal distillate, and even lead compounds is adding further danger. Heavy vapour from spilt gasoline may drift into a pit where a man is working or poison him if the garage be closed. The writer calls for thorough investigation to establish the damage to health resulting and to determine the best preventive measures.—An interesting description is given by P. Drinker and R. M. Thomson of a portable alternating current precipitator for determining dust, fumes, and smokes present in air. The apparatus, which is illustrated, weighs 13 lb., and samples for microscopic study can be obtained.—The need for determining the zinc content of various foods, animal tissues and bone, and excreta, in cases of both normal and abnormal contact with zinc has led R. E. Lutz to develop a method for detecting accurately amounts varying from 0·01 mg. to 0·5 mg. by the action of zinc salts on urobilin. The method is described and discussed critically, with reference to previous work done on the subject.

ROYAL COMMISSION ON LUNACY AND MENTAL DISORDER.

FURTHER SITTINGS.

(*Continued from p. 1367, June 27th.*)

EVIDENCE OF L.C.C. MENTAL HOSPITALS COMMITTEE.

AT the resumed meeting of the Commission on July 10th, the Hon. W. Sidney, J.P., and Mrs. Dunn Gardner, J.P. (chairman and vice-chairman of the L.C.C. Mental Hospitals Committee), gave evidence and stated that their view—supported by the Council—was that provision for temporary treatment without certification should fall on the same authority as that responsible for the established mental hospitals. Also, they thought that any legislation for early treatment of mental cases should allow patients who did not possess volition to be treated, as well as really voluntary patients. The Council considered that for compulsory detention two medical certificates—one from a specially approved general practitioner—should be required. The number of medical officers treating mental cases under the Council had of recent years been considerably increased. Hospitals with 2000 patients or over were allowed eight assistant medical officers. The Council did all they could to induce young medical officers to obtain the diploma in psychological medicine, and had arranged courses of lectures at the Maudsley Hospital for post-graduate students in this regard. The eighth course was now being delivered. Leave was also granted to attend a three-months course at the same hospital. Here was the chief pathological laboratory in connexion with the London County mental hospitals. The director of this laboratory was Dr. F. L. Golla, who followed Sir Frederick Mott, the latter now occupying the chair of mental pathology at Birmingham University. A properly equipped laboratory was provided at each mental hospital under the Council, and Dr. Golla conducted a periodic inspection of these laboratories, and reported on the work being done in them.

With regard to the nurses in the Council's mental hospitals, every inducement was held out to them to gain the mental nursing diploma. Recognising the onerous and somewhat distasteful work these nurses were sometimes called upon to do, and in order to make the staff as contented with their conditions as possible, the Council had shortened the hours and increased the rate of remuneration paid. It was difficult to secure a sufficient number of suitable women for this nursing work.

ASSOCIATION OF MUNICIPAL CORPORATIONS.

On the following day, July 11th, evidence on behalf of the Association of Municipal Corporations was given by Sir Lewis Beard, the town clerk of Blackburn. He said the average yearly increase in the number of patients who needed treatment in mental hospitals in England and Wales for the years 1920 to 1923 was 3565, and his Association's suggestion—until building was a less burdensome matter—was that use should be made of vacant institutions under the control of the Poor-law guardians. These, he thought, could be used for the more chronic type of case, and this would release space in the usual mental hospitals for acute cases in which treatment was likely to bring results. He had in mind the ordinary residential wards of the Poor-law institutions. His Association, he said, supported the Mental Treatment Bill, and their view was that it ought to be made possible to treat incipient cases without first having them certified. His individual opinion, also, was that it would be well if local authorities were to undertake the instruction of the public as to the general nature of mental disorder and the need for it to be treated at quite an early stage. A further advantage of this would be the dissipation of much of the unfounded prejudice in regard to insanity and the methods of treating it.

He had had a good deal of experience as a visitor to asylums, and suggested that committees appointed to do the visiting should be named "mental hospital committee" as he thought the usual name of "visiting committee" conveyed the impression that the inspection was of a perfunctory character, instead of the careful and interested inspection which was needed. He was against the Board of Control being given mandatory powers in place of the present advisory functions, as he wished to preserve to local authorities a good deal of freedom concerning details.

GIFT TO THE NATIONAL ORTHOPÆDIC HOSPITAL.—Mr. Dudley Docker has promised to contribute £5000 towards the £87,500 required by the Royal National Orthopædic Hospital on condition that four others will give a similar amount.

MEMORIAL TO THE LATE DR. WALLACE BEATTY, OF DUBLIN.—On July 6th a tablet to the memory of the late Dr. Wallace Beatty was unveiled in the hall of the Adelaide Hospital, with which he was so long connected. In addition to erecting the tablet the committee in charge of the memorial has in its hands a fund from which it is hoped to help nurses and students of the hospital financially embarrassed. The ceremony of unveiling was performed by Dr. Walter Smith, Dr. Beatty's predecessor at the Adelaide Hospital. He referred briefly to Dr. Beatty's fame and skill as a dermatologist, and more especially to his kindness, charity, and character as a man.

THE LANCET.

LONDON: SATURDAY, JULY 18, 1925.

TOWARDS THE SOLUTION OF THE CANCER PROBLEM.

THE publication in THE LANCET to-day of the paper by Dr. W. E. GYE on "The Ætiology of Malignant New Growths," marks an event in the history of medicine. For these observations may, we believe, represent a solution of the central problem of cancer. His carefully controlled experimental evidence leads to certain fundamental conclusions which may be briefly summarised as follows:—

1. All malignant new growths contain an ultramicroscopic virus—or group of viruses—which can be cultivated. This applies to the carcinomata and sarcomata of fowl, mice, rats, dogs, and man. The virus resides probably within the cells of the neoplasms.

2. The virus alone, washed free from all adherent material, does not produce a tumour when injected, and does not even produce a visible lesion.

3. But when injected together with virus-free extracts of tumours the virus produces a malignant new growth. The extracts contain, therefore, a substance called by Dr. GYE the "specific factor," which enables the virus to attack the cells of the injected animal so as to transform them into cancer cells.

4. There is no species specificity so far as the virus is concerned, for tumours can be obtained in one species of animals with the virus obtained from the tumour of another species.

5. The "specific factor" shows a very strict specificity of species. Thus in order to produce a malignant new growth in a mouse it is necessary to use the specific factor from a mouse tumour, while the specific factor of a chicken tumour is ineffective.

6. There is probably also a strict specificity of tissue for the specific factor. So far only sarcomata have been obtained, and these only with a mixture of virus and the specific factor from sarcomata, not from carcinomata.

The existence of a virus is not merely postulated from the effects of a culture supposed to contain it, as has hitherto been the case. The paper by Mr. J. E. BARNARD on "The Microscopical Examination of Filterable Viruses" follows Dr. GYE's communication, and in this he has applied the optical methods elaborated by him for the study of the organisms of bovine pleuro-pneumonia, the largest of the known filter-passing viruses, to the study of the cancer viruses cultured by Dr. GYE, and shows that he has succeeded in rendering the cancer virus visible and even in photographing it. This is in itself a great achievement. The results of Mr. BARNARD's observation so closely correspond with the experimental results obtained by Dr. GYE that the existence of a living cancer virus would appear to be established. The reasons for this broad opinion follow.

In order to make clearer the relationship existing between the virus and the specific factor, definite examples may be given. We will call the virus obtained from a mouse tumour "mouse virus," from a human tumour "human virus," and so on. Similarly we will call the "specific substance" obtained from a mouse carcinoma "mouse carcinoma specific," from a human carcinoma "human carcinoma specific," from a fowl sarcoma "fowl sarcoma specific," and so on. Then the following relationships have been established experimentally after injection:—

(*a*) Any virus alone from any neoplasm into any animal: no effect.

(*b*) Any specific from any neoplasm into any animal: no effect.

(*c*) Mouse carcinoma virus + fowl sarcoma specific: (1) Injected into mice—no effect; (2) injected into fowls—sarcoma.

(*d*) Human carcinoma virus + fowl sarcoma specific injected: Into mice—nothing; into fowls—sarcoma.

It follows, therefore, that the type of malignant new growth that is produced depends not upon the virus, but upon the specific substance. There are, therefore, two factors concerned in the ætiology of cancer: (1) A living virus—the extrinsic factor; and (2) a chemical substance produced by the cells—the intrinsic factor.

The "germ theory" of cancer is, of course, not a new one. It has often been advanced and has as often been rejected. It has been pointed out in the past, and quite truly, that it does not explain cancer. Recently an American authority on cancer has gone so far as to make the categorical statement: "There are many things which we do not know about cancer to-day, but there is one thing that we do know and that is that it is not of germ origin." That is not merely the opinion of a single individual, but it represents the view of almost every pathologist of repute. That view is not merely justified by the consideration that in the past no one has ever isolated an organism which when injected would produce with certainty a typical malignant new growth. As we shall see it is true even to-day in the light of Dr. GYE's work to say that the presence of an organism *by itself* cannot account for the fundamental features of cancer, and if the statement quoted above had been formulated in this way no exception could be taken to it. The position may be stated more generally by saying that cancer cannot be explained by postulating an entirely extrinsic origin.

Why, then, do we accept Dr. GYE's observations as a solution of the cancer problem? In order to appreciate the full significance of this work it is necessary to review briefly the present state of the cancer problem. A brief historical summary of the development of cancer research shows both the peculiar dilemma with which every attempt at explaining cancer was faced and the brilliant way in which Dr. GYE has dealt with it. Up to the beginning of this century the investigation of cancer was entirely in the hands of morbid anatomists and morbid histologists. They described the morphological appearances of the different tumours found in man and classified them; they made the fundamental distinction between neoplasms derived from epithelial cells and from connective tissue cells; they showed that each individual tumour had individual morphological features, and that these features were retained by the metastatic deposits; they correlated different degrees of malignancy with morphological differences. From the point of view of treatment the most important contribution was the work of RIBBERT and of BUTLIN.

The former from a study of early carcinomata showed that cancer in its inception was a local disease. BUTLIN, applying this conclusion to surgical treatment, emphasised the importance of operative removal at the very earliest stage of cancer and demonstrated in this way that cancer, if attacked sufficiently early, was a curable disease.

There was also a considerable output of theories concerning cancer. Every possible—and impossible—explanation that human ingenuity could devise was put forward. Fortunately it is not necessary to review these various theories. It is sufficient to say that they have not assisted in the investigation of cancer; it may be said that these guesses at the truth have been of as little value to cancer research as racing tips are to the breeding of horses.

The exclusive occupation with cancer as it occurs in man led, however, to one curious result: it gave rise to the belief that cancer was essentially a disease of man. When in 1888 HANAU described a tumour in a rat and successfully transplanted it into other rats, this important observation was allowed to pass unnoticed. The same fate befell the similar observations which MORAU made soon afterwards. If we consult the standard work of the time, BORST'S big volume, published in 1902 and entitled "Die Lehre von den Geschwülsten," no reference at all is to be found to the tumours of animals, although the occurrence of such tumours was well known to veterinary pathologists who had published descriptions in the literature. When, therefore, in 1902 Prof. JENSEN, of Copenhagen, recorded the successful transplantation of a mouse carcinoma into other mice after previous attempts with three other carcinomata had failed, his work did not attract much attention and would probably have shared the fate of HANAU'S and MORAU'S but for a fortunate coincidence. In 1902 the Imperial Cancer Research Fund had come into existence. The late Dr. E. F. BASHFORD, who had been placed in charge of the work of the Fund and who in his preliminary scheme of investigation had emphasised the importance of placing cancer research on an experimental basis, recognised the value of JENSEN'S work and devoted all the resources of the new institution to make the study of cancer one of experimental and comparative pathology. Together with Dr. J. A. MURRAY, he showed that the phenomenon of cancer was common to the whole vertebrate kingdom. By studying the pathology of JENSEN'S tumour and other tumours in mice, these two workers showed that these tumours corresponded in every respect to cancer in man. They confirmed JENSEN'S conclusion that in the process of transplantation the transplanted tumour grew from the cells of the minute piece of tumour that had been introduced by the needle and not by a transformation of the cells of the new host, who only provided the stroma necessary to nourish the cancer cells. This meant that the experimental transmission of a tumour from one animal to another was not a process of infection but one of true transplantation. Every spontaneous tumour in mice that was investigated was shown to possess a definite biological individuality which manifested itself not only by its morphological appearance, but also by such features as its rate of growth, its tendency to necrosis or spontaneous absorption, its power to elicit a specific stroma reaction. What is more, every tumour retained this biological individuality through many years of transplantation, and there was no evidence of convergence to a common type. Although a successful transplantation, of a mouse tumour into other mice was comparatively easy, it was found impossible to transplant a mouse tumour into animals of a different species. This strict species specificity explained the negative results which had attended previous attempts, such as those of SHATTOCK and BALLANCE, to transplant a human cancer into animals. The transplantation of a cancer from one mouse to another was found to be dependent upon the life of the transplanted cancer cells. Inoculation of extracts of tumours or dried tumour material failed to produce new growths, and similarly negative results were obtained when the tumour cells had been kept in an incubator sufficiently long to impair their vitality.

Another important conclusion which followed from these observations was that when a cancer arises in an organism it arises there *de novo* as a result of a change in the cells of that animal and not by the introduction of a cell already cancerous from another animal; each case of cancer was, so to speak, an individual disease. Results such as these could not be accounted for readily on the basis of a germ theory pure and simple. We should have to assume a highly specific virus not only for each species of animal but even for each individual case of cancer. As if to emphasise this conclusion there was on record a tumour of the dog which, though indistinguishable from a typical sarcoma in its morphological appearance and its property to metastasise freely, clearly showed from its clinical history that it did not arise *de novo* but was transmitted during coitus from the vagina to the penis and vice versa. This venereal tumour had been the subject of careful experimental study by BELLINGHAM SMITH and J. W. WASHBOURN in 1897. They clearly recognised the infective nature of the disease—a conclusion which was confirmed by BASHFORD and MURRAY, who contrasted it with the tumours of mice, and by most subsequent observers. It was accordingly called either an infective granuloma or an infective sarcoma, even though no infective agent could be isolated. It has never been clearly established whether the tumour was transmitted during coitus by a process of infection or by the rubbing in of living cells from a tumour on the penis into the vagina, and conversely from a tumour in the vagina into the penis. But whatever the process was by which it was transmitted, it was clear that it did not arise *de novo* in each animal in the same way as most neoplasms arise. Here, then, was the first clear evidence that tumours existed which could not be distinguished morphologically from a typical sarcoma but which had apparently quite a different ætiology.

Other evidence soon followed, but the attempt to place cancer research on an experimental basis by studying it in animals met at first with violent opposition by many pathologists. They maintained that cancer in mice was a disease quite different from cancer in man. But by the persistent accumulation of facts, BASHFORD and his collaborators carried the day. Cancer research institutes were established all over the world where the various aspects of the cancer problem were being studied experimentally in animals.

Then a really extraordinary observation was made in 1911 by Dr. PEYTON ROUS, of the Rockefeller Institute. In a fowl he found a sarcoma which could be transmitted to other chickens not merely by the introduction of the living tumour cells, but also by an extract which had been rendered cell-free by filtration through a Berkefeld filter. The same successful result could be obtained with the dead tumour material which had been dried and kept for some time. Pursuing this line of investigation he found two other sarcomata in fowls showing the same properties. But not all tumours of fowls behaved in this way:

many of them, like the tumours of mice, failed to yield tumours with the cell-free filtrate or the desiccated tumour. Here, then, was convincing experimental evidence that in certain cases a tumour could be produced *de novo* either by a living virus or by a chemical agent. And the most perplexing feature of these extraordinary observations was this: Each of the three sarcomata showed a very distinctive biological individuality in their morphological appearance—one of them, for instance, being an osteo-chondrosarcoma. Tumours which were produced by the cell-free filtrate or by the dead dried tumour material retained this biological individuality in the same way as did the mouse tumours which depended for their propagation on the living tumour cell! The most obvious explanation appeared to be that these tumours were due to a virus. But if that was so, why did the virus reproduce the biological individuality of each tumour? There seemed to be no answer to that question, and PEYTON ROUS, after having contributed one of the most important and disturbing observations, retired, baffled, from cancer research, as EHRLICH had done before him.

The next advance in cancer research was made by FIBIGER. He produced cancer of the stomach in rats by allowing a nematode to develop in the wall of the stomach. Once the carcinoma had developed it could be propagated in other rats in the usual way by the transplantation of the living tumour cells so that the presence of the nematode was not an essential factor in the growth of the tumour once it had been induced. Similarly BULLOCK and CURTIS, in the Crocker Institute in New York, produced sarcomata in the liver of rats by infecting the rats with the eggs of *Tænia crassicollis*. The sarcomata then developed in the walls of the cysticercus cysts. YAMAGIWA and ISHIKAWA, interpreting these results as being due to chronic irritation, produced epitheliomata in rabbits and mice by the prolonged painting of the skin with tar.

This line of investigation on the experimental production of cancer again offered no evidence in favour of the germ theory of cancer. On the contrary, the multiplicity of agents capable of inducing cancer, the long latent period in tar cancer, the cellular hyperplasia preceding the cancerous change had to be interpreted as arguments against an extrinsic origin and in favour of an intrinsic origin of cancer. Now that we know the solution, it is fascinating to retrace the history of experimental cancer research and to see how the objective, unbiassed collection of observations bearing on cancer in animals had led up to this dilemma: there was a large body of observations which could not be accounted for satisfactorily by postulating an organism as the cause of cancer. They indicated rather that the cancerous change was associated with a change in the metabolism of the cells, perhaps the production of a substance stimulating growth as indicated by the studies of CARREL, BURROWS, DREW, and others on the cultivating of cells in vitro. On the other hand, there were the tumours described by ROUS and the venereal dog tumour which, though morphologically typical malignant new growths, seemed to have an entirely different ætiology and could be explained most readily by postulating an infective agent. Most workers tried to escape from this maze by setting aside tumours such as those described by ROUS as being infective granulomata and by making a sharp distinction between such tumours and true neoplasms. But such a conclusion was merely an attempt to evade the difficulty. As has been stated, the fowl tumours were morphologically and clinically indistinguishable from true neoplasma, and apparently arose *de novo* in each animal, and their infective nature could only be established by experimental methods. How was it possible, then, to decide whether a tumour in man was an infective granuloma of this type or a true neoplasm? It has also been stated that the fowl tumours retained their biological individuality, when they were induced by infection with the cell-free filtrate. If it is admitted that a virus can produce a cell proliferation of as definite a biological individuality as a true neoplasm, this feature of true neoplasms ceases to be an argument against the parasitic origin of cancer. CARREL has recently tried to get over this difficulty by denying that the chicken tumours are due to a virus. But the cultivation of a virus by Dr. GYE and the success of Mr. BARNARD in rendering the virus visible under the microscope renders this view untenable.

Dr. GYE's work has solved this dilemma in a manner which is as unexpected as it is convincing. He shows that there is both an extrinsic and an intrinsic factor concerned in the ætiology of cancer. The extrinsic factor is a virus common to all neoplasms. By itself it is incapable of producing a neoplasm. To do that it requires the intrinsic factor—a substance produced by the cells which enables the virus to attack the cells. The virus can be cultivated. The intrinsic factor which so far has been demonstrated only in different tumours is presumably produced by the cells in the course of chronic irritation. The intrinsic factor varies from tissue to tissue and from tumour to tumour. In such tumours as those observed by ROUS it is abundant and very resistant, so that it persists even in an extract made without special precautions; in most other tumours it is present in small amounts and very labile, so that special anaerobic conditions are necessary to preserve it and to demonstrate its existence. This apparently fundamental difference between the ROUS tumours and other tumours is, therefore, merely the manifestation of different degrees of lability of this specific substance. Experimental cancer research has brought to light a number of other facts, the explanation of which has hitherto presented great difficulties. As an instance we may mention the development of sarcomata in the course of the experimental propagation of certain carcinomata as described by EHRLICH, by HAALAND, and by RUSSELL. For all these difficulties Dr. GYE's work offers a satisfying solution—a good test of the value of the conception which he has formulated of the ætiology of cancer. As already stated, Dr. GYE has succeeded in producing a sarcoma with the virus obtained from a carcinoma. The reverse result has not yet been attained—nor has it ever been observed to occur spontaneously in the course of the experimental propagation of sarcomata.

The work of Dr. GYE is the outcome of an investigation on ultramicroscopic viruses instituted by the Medical Research Council. A group of men were appointed to work in different special directions, a member of which, Dr. P. P. LAIDLAW, gave invaluable help towards finding the direction in which new researches might most profitably proceed. The Medical Research Council is to be congratulated on having secured the services of Dr. GYE and Mr. BARNARD, whose successful work has opened up a new chapter in the investigation of disease. We have stated at the outset that we hold Dr. GYE's work to be a solution of the central problem of cancer. But it is more than that. Dr. GYE has also evolved a technique for cultivating ultramicroscopic viruses and a method of testing for their presence. The observation that a virus by itself is non-pathogenic, and requires an accessory substance

to produce a specific disease may prove to be of the greatest importance in the further study of the diseases due to these viruses. As Dr. GYE points out, the fact that an organism can be non-pathogenic by itself and manifests its specific pathogenicity only in the presence of some accessory factor is not peculiar to the virus of cancer. A few years ago Dr. CRAMER and Dr. GYE showed that such a phenomenon plays a part in many well-known bacterial infections. Thus the bacteria of gas gangrene by themselves are non-pathogenic. But when certain simple chemical substances are also injected, such as calcium chloride or colloidal silicic acid, a slight but specific lesion is produced in the tissues, and then the specific infection is elicited and kills the animal. They called this phenomenon "defence rupture" or "kataphylaxis," and pointed out that it applied to other bacterial infections. For instance it holds good for tetanus, and even the course of streptococcal infections may be profoundly altered by the presence of such kataphylactic substances. GYE and KETTLE found this phenomenon to apply also to tuberculous infections. The phenomenon is obviously of considerable importance in determining both the onset and what is vaguely called the virulence of bacterial infections, and it is curious that the importance of these observations was not generally recognised by bacteriologists. But a few months ago Dr. COLEY—the New York surgeon—referred to these observations of CRAMER and GYE in a symposium on cancer, in which he presented the evidence in favour of the parasitic theory of cancer. COLEY suggested that the cancer parasite postulated by him required kataphylaxis to attack the cells so as to produce the cancer lesion—probably the only correct guess that has been made in the voluminous literature of cancer theories.

All this work has cleared the way for a rapid advance in the investigation of cancer along entirely new but clearly defined lines. A host of new questions has arisen, and we have no doubt that by answering them the attack on the cancer problem, which has hitherto baffled medical science, will be brought to a successful conclusion. But there is a far wider outlook than this. The new technical methods now made available will be applicable to research along a whole enormous front. Diseases like measles, small-pox and encephalitis, foot-and-mouth disease and dogs' distemper, may yield their secrets to workers armed with these new weapons.

ROYAL COMMISSION ON NATIONAL HEALTH INSURANCE.—The thirty-seventh meeting of the Commission was held at the Home Office on July 7th, Lord Lawrence of Kingsgate and later Sir Arthur Worley in the chair. A statement by the Government Actuary dealing with the results of the second valuation of approved societies so far as completed was considered by the Commission. Evidence was submitted by the Stepney Borough Council, represented by Councillor J. H. Barnby, as to the payment of contributions in respect of men casually employed on relief works; by the Sons of Temperance Friendly Society, represented by Mr. T. W. Huntley, as to various matters of approved society administration; by the Association of Poor-law Unions, represented by Mr. R. A. Leach, as to the relations of Poor-law relief to Health Insurance benefits. Thereafter Mr. W. J. Braithwaite gave evidence on the question of the case-value method of remuneration of panel practitioners.—The thirty-eighth meeting of the Commission was held at the Home Office on July 9th, when evidence was submitted on behalf of the National Association of Trade Union Approved Societies by Mr. F. Kershaw, President; Mr. E. Corbey, Secretary; and Mr. G. W. Canter, ex-President of the Association, and Mr. G. P. Blizard covering the whole range of the Health Insurance Scheme, in particular the need for expanding and unifying the arrangements of the various health services.

Annotations.

"Ne quid nimis."

CURRENT MEDICAL POLITICS.

THE Representative Meeting of the British Medical Association, now in session at Bath, has before it some important matters of medical policy. A memorandum on Coroners' Law and Death Certification sets out the present anomalies and the difficulties in which the practitioner may be placed. The suggested remedy is one which has already been embodied in a Bill which failed to receive Parliamentary assent two years ago. Therein it was proposed to have two certificate forms, one of which would certify the fact of death or stillbirth and would be signed by the medical practitioner, after viewing the body, within 24 hours after the decease has been notified to him. In addition to this he would forward direct to the registrar a further report as to the cause of death, including any scientific data considered desirable. These reports would be filed in a separate register not open to inspection except by a coroner, a medical officer of health, or superior police officer. Should the certificate of the fact of death not conform with the statutory type the registrar would inform the coroner. The suggested fee for death certification is 5*s*., with a mileage bonus of 2*s*. per mile. No doubt the Representative Meeting is giving attention to the additional burden which this procedure would lay upon the practitioner, and to the question whether it is desirable to withhold from relatives the certified cause of death. The revised report of the Ethical Committee of the Association on the subject of Indirect Methods of Advertising will come up for approval, which carries with it the possibility of issuing a ruling which should guide the practitioner who wishes to publish articles in the lay press without overstepping the bounds of professional liberty. The Special Committee appointed to consider puerperal morbidity and mortality may have some practical contribution to make to another problem which touches the practitioner very closely. The representation of the general practitioner on the General Medical Council will be raised by a Division which is not satisfied with the present status. Prolonged discussion is also probable on the Hospitals Policy of the Association. The principle of contributory schemes and staff funds has been accepted by the Representative Body as a whole, but there is still much difference of opinion as to whether contributions by employers or employees should be regarded as contributions for services rendered or to be rendered. As a result of an instruction given at the Bradford meeting, the Council of the Association is recommending to the Representative Body the establishment of a B.M.A. Charities Committee, the duty of which it would be to direct the attention of members to the need for contributions and to manage a "Charities Trust Fund," the moneys to be distributed among the existing medical benevolent organisations. There is ample matter on the agenda to fill up the four days allotted.

ASCARIS LUMBRICOIDES IN HERTFORDSHIRE.

ASCARIASIS is generally considered to be rare in this country, but in 1923 the attention of the Ministry of Health was drawn to the prevalence of this nematode in the small hamlet of St. Margaret's, Hertfordshire. The village consists of ten cottages with a population of some 60 persons, mostly children, and the source of the infestation appeared to be the water-supply, a pump with disordered valves. The report [1] of the Ministry has now been published by Dr. S. Monckton

[1] Reports on Public Health Medical Subjects, No. 31. H.M. Stationery Office. 6*d*.

Copeman, together with an abstract bibliography of the subject and a tabular review of the symptoms presented by 158 cases of ascariasis under the observation of Dr. F. C. Wellman, of Angola. This is interesting to compare with a similar analysis published some years ago by Mr. W. H. Haw, of Cape Colony.[2] Prof. R. T. Leiper's investigation of ankylostomiasis in Cornish miners revealed a concomitant infection with ascaris in 14·7 per cent., and the general experience of practitioners in Cornwall is that ascariasis is by no means uncommon there. Records at St. Margaret's indicate that the inhabitants have been almost universally affected for several generations and include the story of the infestation of an infant said to be totally breast-fed and of a child who died after vomiting between 60 and 70 worms. It was this fatal case that drew the attention of the medical officer of health to the condition of the hamlet. The endemic prevalence is ascribed to the keeping of pigs and the use of material from the cottage earth-closets and pig-sties as manure. It is being combated by measures of personal hygiene and the repair of the pump. The report includes a survey of the biology and pathology of the worm and a chapter on treatment. Clinically it is agreed that santonin is the most efficient drug, though opinion differs as to whether it acts by killing the worms or merely by lowering their vitality so that they are unable to resist the peristaltic waves. As was pointed out in THE LANCET recently,[3] the answer to this problem may lie in an appreciation of the comparative insolubility of santonin.

THE FATAL ILLNESS OF THE EMPEROR FREDERICK: LARYNGOFISSURE THEN AND NOW.

IN an obituary notice of the late Mr. Mark Hovell, which appeared in THE LANCET last week, the controversy was recalled which raged over the illness and death of the German Crown Prince, later the Emperor Frederick III., for Mr. Hovell was resident at the palace during the latter part of the illness as deputy to Sir Morell Mackenzie, the Prince's chosen adviser. Looked at from the present distance of time the controversy seems to have been largely unnecessary, and to have been due in great measure to jealousy of a foreign colleague in control of an august person. Sir Morell Mackenzie occupied an invidious position, and, although perhaps no one now can know the details of the intrigues which surrounded the conduct of the case, it appears that he was actuated by a single-minded devotion to the medical welfare of his patient. It was a difficult laryngeal case for diagnosis. When Mackenzie first examined the patient in May, 1887, there was a warty swelling over the left vocal process which was suggestive, but not pathognomonic, of cancer. He refused to give an opinion, but removed endolaryngeally on several occasions portions of the growth for microscopical examination. On each occasion Prof. Virchow reported that these specimens, which included the deep parts, showed no evidence of cancer, and he characterised the lesion as a "pachydermia verrucosa." It was not until after the lapse of six months, during which time the Crown Prince attended Queen Victoria's Jubilee and spent some weeks in Britain, that the laryngoscopic appearance became more highly suggestive of malignant disease. In November a subglottic growth was visible on both sides of the larynx; on Feb. 9th, 1888, tracheotomy was performed by Dr. Bramann. The patient died on June 13th, having become Emperor on the death of his father on March 9th. There had been much irritation of the trachea from the tubes, and considerable sloughing of the wound, which Mackenzie believed might have been avoided had his advice on the type of tube been followed. His management of the case appears to have been correct in the light of the results, up to that time, of the treatment of laryngeal cancer by laryngofissure and by laryngectomy. It is possible that, with our present knowledge, a correct diagnosis would have been made in the early stage of the disease, and that a laryngofissure might have been successful, though tumours affecting the vocal process are not particularly favourable objects for operative interference. But with Virchow's reports before him Mackenzie could not have been expected to advocate external operation; when the bilateral subglottic tumours appeared in November nothing but a total laryngectomy would have been possible, and this the patient had already refused. In his book, "Frederick the Noble," Mackenzie gives tables of the results of the various laryngeal operations to that time; 22 cases of laryngofissure had been collected with two successes and an immediate mortality of 6, or 27·2 per cent. The work of Butlin and Semon subsequently developed this operation, so that an intrinsic laryngeal cancer is perhaps as favourable for removal as any malignant growth, and recent statistics show an operative mortality of 6 per cent. and freedom from recurrence for three or more years of 47 per cent. In passing judgment on Mackenzie the accepted teaching of the day must be remembered; indeed, this should always be in our minds when reviewing the procedures of our predecessors.

[2] THE LANCET, 1904, i., 1722.
[3] THE LANCET, 1924, ii., 124.

MECKEL'S DIVERTICULUM.

OF developmental anomalies of the omphalomesenteric duct Meckel's diverticulum is probably the most common. The diverticulum, as such, produces no symptoms, but is liable to cause intestinal obstruction, either by becoming twisted, the torsion involving the bowel from which the diverticulum springs or by snaring a loop of bowel, the apex of the diverticulum being attached, either to the umbilicus congenitally, or to some portion of peritoneum by acquired adhesions. Opinions differ as to whether a healthy Meckel's diverticulum, discovered accidentally during operation, should be removed. Owing to its free opening into the ileum acute inflammation of the diverticulum is rare, but, when it occurs, has a high mortality. Preoperative diagnosis of a Meckel's diverticulum as the cause of an "acute abdomen" is usually impossible. Dr. F. Christopher has recorded [1] a case from St. Luke's Hospital, Chicago, of diverticulitis with perforation. A man, aged 47, had been ill for two weeks with pain in the left lower abdomen, accompanied by fever and rigors. In the left iliac fossa was a very tender elliptical tumour, 4 by 8 in., slightly movable. Leucocytosis 12,800. Cœliotomy revealed some gas and pus, and a tumour composed of adherent omentum enveloping a necrotic diverticulum. The diverticulum was excised and the ileum was sutured. Recovery ensued after a stormy convalescence. On the fifth day a fæcal fistula developed and persisted, though diminishing in size, up to the time of the report, 19 weeks after operation.

RADIUM TREATMENT OF THE UTERUS.

THE annual report[2] on the treatment of patients at University College Hospital with the radium allotted by the Medical Research Council contains, in addition to the work of 1924, a summary of the results of the last three and a half years. The hospital has the loan of 372 mg. of radium sulphate which is put up in 11 containers of 0·5 mm. thickness of platinum. Dr. R. T. Lewis refers specially to the treatment of carcinoma of the cervix and menorrhagia. In regard to the former he repeats a warning which has been made elsewhere, and which cannot be too strongly impressed, when he refers to the "stimulant effect of *inadequate* radiation, causing generalised carcinomatosis." More and more is the fact brought out that if the operator has an inadequate amount of radium

[1] International Clinics, Series xxxv., vol. i., p. 67.
[2] London: John Bale, Sons and Danielsson, Ltd. 1925.

salt at his disposal he would do better to leave a case alone than merely to stimulate its growth in place of administering the lethal dose it requires. This specially applies to the inadequate application of radium plates externally for the treatment of carcinoma of the cervix. Dr. Lewis states definitely: "Carcinoma of the cervix adequately treated [with radium] disappears entirely," so that the operator should select for treatment those cases for which his supply of radium is adequate to ensure a prospect of cure or at least retardation of the growth. A valuable section of the report describes the results of treatment by radium of menorrhagia. Out of one group of 32 cases of menopause hæmorrhage treated, 27 are now well in every way. In cases of essential menorrhagia in young women with no signs of pelvic disease encouraging results were procured, and cases were cured after treatment by drugs and curettage had failed. Menorrhagia due to fibroids also responded well to radium. One container holding from 100 to 150 mg. of radium sulphate, placed inside the uterus, reduced large fibroids in a dramatic fashion. At University College Hospital it does not appear to be the practice, as it is at the London Radium Institute, to "cross-fire" these fibroids with heavy plating from outside. The whole report makes encouraging reading.

THE BATEMAN APPEAL.

IT has been decided to close this Fund, and we thank those of our readers who supported the appeal. The money subscribed has been of the greatest possible service to Dr. Bateman, though the total was less than we had anticipated. The fact that Dr. Bateman had joined no society for coöperative defence influenced many, as we know by their letters, to withhold support, so that it is evident from the outcome of this appeal that the medical profession at large is not prepared to sympathise with those of its members who neglect the obvious precaution of insurance.

SHIPS DISABLED BY DENGUE.

WHEN the sloop, *Antarès*, of the French Navy, was lying at Bahia[1] on Oct. 21st, 1923, 52 of her ship's company of 99 were on the sick-list with dengue. She had in all 71 cases, of whom 43 were sent to hospital. Though only one died the epidemic very seriously impaired the efficiency of the ship, since she was immobilised for two months and 25 men had to be invalided home. She had lain at Dakar, in Senegal, the westmost port of Africa, from Sept. 29th to Oct. 7th, three of the days in dry dock. There was at that time no report of dengue in the colony, only of influenza; mosquitoes were reported "numerous," as is usual at that port. The *Ango*, which had preceded her in the dry dock, had, on arrival at Havre, 40 out of a crew of 56 sick, and in all 55 were received into hospital. The malady was never officially given a name at Havre, but people spoke of paludism, bilious fever, and even of scarlatina, owing to the eruption. *Antarès* left Dakar on Oct. 7th for Bahia, crossed the line on the 11th with the usual celebrations, the ship's company alert and well, though some were bothered with headaches. On the 13th dengue began to show itself quite clearly in 11 cases with frontal headache, suffused eyes, pains in joints without redness or swelling, vomiting, pyrexia, and a fleeting rash; no coryza or sore-throat. Many recovered in two or three days, but there were 25 sick when the ship arrived at Bahia on the 15th. Here the numbers rose rapidly; on the 23rd 35 cases were sent to hospital and others later, where they improved so rapidly that 38 convalescents were returned in the next ten days. The characteristic polymorph leucopenia of dengue was noted in hospital. On Nov. 5th, however, all the five still in hospital, and most of those sent back, relapsed. There were no new men attacked, and those relapsing were far more ill than in the first period, the complications being jaundice, with tenderness and enlargement of the liver, and obstinate constipation. Convalescence was painfully prolonged with great muscular weakness and pyrexia on exertion. No treatment was specially successful, though antipyrin eased pain. Milk caused vomiting, but diluents were readily taken. The disease is ascribed by Dr. Bideau, medical officer of the ship, to a culex, but since he wrote *Aedes argenteus* (*Stegomyia fasciata* in old terminology) is generally incriminated. The insect is called *A. egypti* by Siler and his fellow workers, who give the incubation periods as 11 days in the mosquito and four to ten days in the men attacked. No mosquitoes were seen in the ship after the 10th, but cases appeared between the 13th and 28th, so it is difficult to understand how the infection spread, if there is no infection from man to man, which Dr. Bideau suggests as concurrently possible. In any case this history emphasises the need for mosquito protection of ships' companies in tropical harbours and especially when in dry docks, particularly in ports, like Dakar, known to be specially plagued with mosquitoes. The recent United States investigators of dengue, Siler and his fellow workers[2] insist on the epidemiological relation of dengue and yellow fever, their distribution by a common carrier, and suggest that each is caused by a filterable virus. Dr. I. J. Bideau, Médecin de 1re classe (Surgeon Lieutenant-Comdr.), the medical officer of the ship, had an anxious experience, but his careful report on the outbreak, with its detailed account of cases, have at least won for him the Prix de Médecine Navale for 1925.

[1] Arch. de Médecine Navales, April, 1925.

PROFESSIONAL X RAY DERMATOSES.

Dr. H. N. Cole, of Cleveland, believes[3] that there are many more cases of radio-dermatitis in professional men, nurses, technicians, and orderlies than is commonly suspected, and it is doubtless with a view to their recognition and treatment before the symptoms have progressed too far that the author has given himself the trouble of collecting the bibliography since 1896 (the X rays were discovered in 1895), describing the symptoms and detailing the pathology and course of Rontgen ray injury as it is seen on the skin. The results are cumulative, but may be postponed for many months or years. In the main they are degenerative, especially in the corium, where sweat and pilosebaceous glands soon tend to disappear. Later the fibrous tissue becomes hyaline, and stains badly with Mallory's phospho-tungstic acid connective tissue stain. Vacuolation and distension of plain muscle-cells may eventually lead to their complete destruction. The most important and far-reaching changes are those noted in the blood-vessels, both arteries and veins. The smaller vessels are obliterated by swelling of the endothelial cells, and thickening of the intima. Elastic fibrils are broken up and absorbed, and may be replaced by fibrous tissue, while the middle coats of arteries become thickened and aid in the general sclerosis of the vascular supply. The newly formed capillaries (telangiectases), so often a striking clinical feature of an old-time X ray injury, are regarded by Dr. Cole as the fruitless attempt of a reparative process to supply a new circulation to avascular tissues, in which as a secondary effect focal necroses are so commonly seen. In the epidermis of an advanced case there are the usual evidences of chronic inflammation, with hyperkeratosis and exfoliation, hyperplasia with acanthosis of the prickle-cell layers, and in serious cases, changes in the basal cell layer (stratum germinativum) with occasional gaps in its continuity. "Perles" of epidermal cells in the upper corium may herald commencing malignant changes. Further study on these lines would certainly be of value in view of the great present-day vogue in radio-diagnosis and therapy.

[2] Jour. Amer. Med. Assoc., May 18th, 1925.

[3] Journal American Medical Association, 1925, lxxxiv., 865.

JUVENILE MORTALITY IN SWINDON.

Dr. Dunstan Brewer, in his latest annual report, states that the real causes of death can only be ascertained by comparing the life-histories of those who die with the life-histories of the survivors, and thus discovering the manner in which adverse factors operate. He is, therefore, compiling the life-histories of Swindon residents who die before reaching adolescence. He gives, however, with the information already at his disposal, an interesting analysis of the deaths of children during 1924.

Neonatal Deaths.—Of the 29 neonatal deaths six were from congenital malformations and theoretically unpreventable, and 17 could not be satisfactorily explained, so that we cannot say whether they were theoretically saveable or not. Of the remaining six, which were satisfactorily explained, four at least were theoretically preventable, three being from congenital syphilis and one from ill-feeding.

Deaths from End of First Month to End of First Year.—These may be divided into those who attended the clinics and whose life-history is known and those about whom information was only obtained after death. It should be explained that the social position of Swindonians is remarkably level, there being few citizens at the top or bottom of the social scale. The so-called residential class is very small and is not fertile. It therefore comes about that 90 per cent. of the children attend the clinics. Among the babies who attended the clinic 12 died, three being breast-fed, nine artificially fed. Of the three breast-fed, one died from an operation for intussusception, one from a congenital blood disease, and one from pneumonia following measles. Of the nine artificially fed four died from ill-feeding, and from respiratory disease following measles or whooping-cough, ill-feeding being a contributory cause of death. Of the 17 children whose life-history was not known five were said to have been breast-fed and 12 artificially fed. Of these breast-fed infants one died from injury, one from syphilis, one from pneumonia, one from bronchitis, and one from pyæmia. Of the artificially-fed "non-clinic" infants, seven apparently died from ill-feeding alone, four from pneumonia following whooping-cough, and one from congenital heart disease. All the clinic children who died were legitimate. Of the others, two were illegitimate and the rest legitimate. The fact that the 90 per cent. of infants who attended the clinics furnished 12 deaths while the 10 per cent. who did not attend furnished 17 deaths indicates that the section of the population for whom attendance at the clinics is most necessary do not use them.

Deaths between 1 and 2 Years of Age.—Fourteen such deaths were registered, 10 being among clinic children. Of the ten clinic children whose history was known five had been breast-fed. Of these, one died from scalds, one from sarcoma of the kidney, and three from pneumonia or bronchitis. Of the five artificially-fed clinic children one died from acute nephritis, one from tuberculous meningitis, three from pneumonia following measles or whooping-cough. Of the four non-clinic children whose history is not properly known, one died from tuberculous meningitis, one from ill-feeding, and two from pneumonia following whooping-cough.

Deaths between the Second and Fifth Year.—Fourteen such deaths occurred, seven among clinic children. Of these latter five were breast and two artificially-fed. Of the breast-fed, one died from scarlet fever, three from pneumonia following measles, and one from tuberculous meningitis. Of the two artificially-fed clinic children one died from appendicitis and one from rickets. Of the seven non-clinic children one died from scalds, one from rheumatic heart disease, one from epilepsy, and four from pneumonia following measles or whooping-cough.

Deaths of Children Aged 5 to 10.—Five such occurred, three being among clinic children. Of the latter, who were all artificially fed in infancy, one died from cerebral tumour, one from rheumatic fever, and one from primary pneumonia. Of the two non-clinic children, one died from epilepsy and one from influenza.

Deaths of Children Aged 10 to 17.—Twelve such children died, but their life-history is not perfectly known. Four died from tuberculosis of the lung, one from tuberculous meningitis, and one from tuberculosis of the spine; one from heart disease, one from pneumonia, one from actinomycosis, one from Bright's disease, one from epilepsy, and one was run over.

It is perfectly obvious from Dr. Brewer's figures that the 10 per cent. of children who do not attend the clinic furnish an undue proportion of deaths up to the age of 10. Dr. Brewer does not think that the severity of the attack furnishes the explanation why one child dies from a disease and another does not, but he thinks the life-history will furnish a sufficient explanation in the case of many diseases such as whooping-cough, pneumonia, and appendicitis. Dr. Brewer goes on to consider the causation of the 26 stillbirths which occurred in Swindon during 1924. No adequate reason is forthcoming for 14. In 12 cases there was some evidence available, but a real explanation only in the case of five which occurred in the maternity home. In the case of one of these five, the fœtus was dead before admission owing to contracted pelvis; in the case of two death was due to asphyxia caused by the impaction of the head in breech presentations; another was due to placenta prævia, and the fifth was a premature puny infant, theoretically unsaveable. Of the seven other stillbirths in the case of which some evidence was available, two could be put down to congenital syphilis, one to a toxæmia of pregnancy, one to pneumonia in the mother, and one to an obscure disease of the mother. The two remaining cases were due to complications of delivery, which might have been foreseen and prevented. Of the 26 stillbirths five only had received any kind of antenatal care and all were legitimate. It will be noted that a very large proportion of the 12 stillbirths, about which there was any real evidence as to cause, were theoretically preventable by antenatal work. Swindon has a population of 56,000, about 1000 births annually, and an infant mortality of under 60 for the last three years, but Dr. Brewer's investigations suggest that a more complete scheme (which he outlines in his report) is capable of effecting very great reductions both in the infant mortality-rate and in the death-rates during the year immediately succeeding infancy.

BIRTH NOTIFICATION.

THE early working of the Notification of Births Act of 1907 was intimately bound up with the life of Mr. Benjamin Broadbent, of Huddersfield, whose death was recorded in our columns a fortnight ago. Some interest attaches to the origin of this Act which was the beginning of a general infant welfare campaign. In December, 1904, the medical officer of health for Huddersfield, Dr. S. G. Moore, submitted to his sanitary authority a preliminary report on the measures employed in France and Germany for the protection of infants. In the course of Dr. Moore's inquiries he learned of a small commune in the Midi, Villiers-le-Duc, where for ten years not a single baby had died during its first year of life. To apply similar methods in Huddersfield required a foreknowledge of the existence of the infants to be saved. At that time the books of the Registrar of Births and Deaths afforded the only means of learning this essential fact, and that indirectly after a delay it might be of six weeks. Not infrequently the medical officer saw the names of newly born infants in the death returns of the same date as the birth returns. With the support of the Health Committee, of which Mr. Broadbent was then chairman, Dr. Moore obtained from the sanitary authority sanction for the payment of one shilling to any person who notified to him within 24 hours the birth of an infant. In the following year authority was obtained in a local Act to require the father of a child, if in residence at the house where the birth took place, to make the notification within 36 hours. Failing the father, any person who was in attendance on the mother at the time of birth or within six hours thereafter was required to notify.

A year later Mr. John Burns, President of the Local Government Board, lent powerful support to the Huddersfield clause, and the Notification of Births Act was passed; at first adoptive, in 1915 it was made compulsory. In the work leading up to this conclusion Mr. Broadbent played an active and enthusiastic part, against opposition which was not always good-humoured. An account of the Huddersfield scheme is set out in a small brochure which is signed jointly by

B. Broadbent and S. G. Moore. Immediately upon receipt of the notification of birth, upon the same day in all cases, a visit is made by a medical woman, whose responsibility is to ensure that no infant shall perish as the result of ignorance on the part of the mother. After her visit or visits the case is handed over to a voluntary association of ladies who have simply to call from time to time in a friendly way. If they find that the baby is not flourishing they send a post-card to the medical officer of health, whereupon the assistant medical officer revisits and if necessary calls in the family doctor. In no case is medical treatment provided by a member of the staff of the public health department.

There can be little doubt that the movement has preserved thousands of human lives during the last 20 years, as well as greatly reducing crippling, blindness, and ill-health. The Huddersfield records are typical of what the Notification of Births Act has made possible throughout the country. The mean infant mortality figure for that borough prior to 1907, the year when the Huddersfield scheme came into full operation, was 155. For the last few years it has averaged about one-half of that figure, and in some single years it has approached one-third. Coincidently the maternal mortality among those whose pregnancies have been made known to the medical officer of health has fallen from 5–6 per 1000 to 2·5, while the neonatal mortality—deaths under one month—has also been materially reduced. In Huddersfield at the present time there is not a single child of school age blind as the result of ophthalmia neonatorum. There will still remain a doubt in the minds of a section of the medical profession as to the exact part played by "direct measures," such as have been here described, in reducing infant mortality as contrasted with the indirect effects of better general education and the improving of a generation of mothers who had the benefit of the Act of 1870. Bristol has been cited as an example of a city where the decline in the infant mortality-rate was as striking as that of Huddersfield in the absence of direct measures. No doubt the latter were both more necessary and more potent in a town like Huddersfield, where many mothers work in factories. However that may be, Benjamin Broadbent will go down to posterity as a pioneer of the child welfare movement, which marked the first quarter of the twentieth century, and as a friend of humanity at its most helpless age.

The Services.

ROYAL ARMY MEDICAL CORPS.

Lt.-Col. P. H. Henderson to be Bt.-Col.

ARMY DENTAL CORPS.

Temp. Capt. J. L. Garrard, from Gen. List., to be Capt.

REGULAR ARMY RESERVE OF OFFICERS.

Maj.-Gen. Sir Alfred P. Blenkinsop, late R.A.M.C., having attained the age limit of liability to recall, ceases to belong to the Res. of Off.

Capt. J. A. Charles, from R.A.M.C., to be Capt.

SUPPLEMENTARY RESERVE OF OFFICERS.

Lt. W. S. Dawson to be Capt.

MILITIA.

Maj. R. M. Beath relinquishes his commn. and retains the rank of Maj.

Capt. A. F. L. Shields resigns his commn.

TERRITORIAL ARMY.

Surg.-Lt. W. S. O'Loughlin (late Royal Navy) to be Capt.

Capt. H. Pinto-Leite to be Maj. (Prov.).

Capt. A. F. L. Shields (late R.A.M.C. Militia) to be Capt.

2nd Lt. H. W. M. Williams (late South Wales Borderers) to be Lt.

INDIAN MEDICAL SERVICE.

Lt. G. H. Fitzgerald to be Capt (Prov.).

Modern Technique in Treatment.

A Series of Special Articles, contributed by invitation, on the Treatment of Medical and Surgical Conditions.

CXXXI.

TREATMENT OF EXTERNAL OTITIS AND FURUNCULOSIS OF THE EXTERNAL AUDITORY MEATUS.

INFLAMMATORY implications of the pinna and fibro-cartilaginous external ear are accompanied by symptoms and local manifestations, sometimes almost indistinguishable from those which arise from extensions of primary middle-ear suppurative infection to the cutaneous tissues behind the auricle. Since a mistake may have distressing consequences where the diagnosis is not obvious after careful examination the surgeon should act as if the more serious condition were present, provided always that he feels assured of his skill in the necessary surgical technique; no harm could come from doing a simple mastoidotomy when only the external ear is inflamed, but most severe complications may follow the treatment of mastoid disease on the lines of an external otitis. In practice, however, it is rare for a surgeon in daily contact with these affections to have much difficulty in making the differential diagnosis. The swelling and tenderness has been superficial throughout in external otitis, and has only recently become so in suppurative mastoiditis. In the last-named condition the shape of the external meatus is similar to that of the sound ear, whilst in external otitis it is narrowed, slit-like, red, and very sensitive to touch with the speculum or a probe. In mastoiditis the drum and middle ear show evidence of inflammation, perforation of the membrane, or discharge of pus, whilst in external otitis the drum may be absolutely normal, except in patients who give a history of old middle-ear suppuration. The discharge from the ear in mastoiditis is stringy and sticky, owing to the presence of mucus from the inflamed middle ear, this property being absent from the pus of furuncular origin. Tenderness to touch is localised to movement of the pinna and external meatal tube when they alone are inflamed, and to the tissues over the surface of the mastoid when the bone beneath is involved. Deafness and tinnitus may be common to both conditions, but pain, which is often the dominant symptom, may be even more pronounced in the less grave of the two affections, because the close attachment of the skin to the cartilaginous tube affords little accommodation for inflammatory œdema; moreover, the pressure is rendered still more intense by the unyielding bony walls if the furuncle is deep in the meatus.

Furunculosis is by far the commonest type of external otitis; the differential diagnosis of the other forms met with—diffuse otitis and acute recurring eczema—is much easier.

Diffuse otitis does not tend to point like a furuncle; the inflammatory induration is not definitely circumscribed, but resembles a cellulitis. It may result from a skin abrasion, infection by staphylococci or streptococci, but is occasionally due to the *Bacillus pyocyaneus*, the latter form being much commoner in parts of the continent than in this country.

Acute recurring eczema is not usually included under the heading of otitis externa in text-books, but the acuteness of its onset, the distress it causes, and the frequency with which unresolved patches of eczema in the region of the external meatal orifice act as the starting-point of furuncular and diffuse inflammation, entitles it, in my opinion, to be so included.

Furunculosis.

The treatment of external otitis of furuncular origin must necessarily vary with the stage of the affection. In all cases, to begin with, 3 gr. of calomel should be given at night followed by a saline in the morning. If the patient is seen very early, before inflammatory infiltration is pronounced, touching the point of infection with pure carbolic may cause the furuncle to abort, but care must be taken to prevent the carbolic flowing beyond the exact spot, otherwise an area of skin may be denuded of epithelium and a further infection result. If the exact point cannot be discovered, carbolic oil should be applied with a piece of wool to the entire meatus twice daily. It serves two purposes, the first being to render practically inactive any organism present in the meatus at the time, and the second to act similarly on any fresh organisms entering from without or from pus escaping when the furuncle matures. In mild cases it is ample treatment and prevents the tendency to recurrences. Excessive moisture in the meatus leads to maceration of the epithelium, and as this facilitates reinfection the amount of liquid left behind should be reduced to a minimum, whether it be oil, lotion, or drops. When there is much inflammatory induration present, accompanied by pain, fomentations give considerable relief, and if persisted in for 24 hours will often suffice to bring the furuncle to maturity and spontaneous rupture. It is a moot point whether fomentations favour the occurrence of furuncular crops or not. If too moist they may do so by macerating the epithelium, but probably not otherwise. If carbolic oil has been previously used it should be cleaned off the skin as carefully as possible or the application of heat over it may result in a blister. The fomentation by itself will produce a blister if too hot, and is then probably responsible for reinfection and some discredit to an excellent method of treatment. Dry sterile wool in the meatus, concha, and around the pinna, over which a rubber hot water bottle is applied, is very comforting.

Advanced Cases.—When, however, the induration is considerable with some surrounding œdema, the progress of the case is slow, and the pain persists, free incision through the furuncle offers the best prospect of early success. An attempt should be made to render the meatus as sterile as possible by using hydrogen peroxide and syringing with warm boric lotion; under a short general anæsthesia, a short, straight tenotomy knife is then passed into the passage, deep to the furuncle, and carried outwards through its centre and down to the base. It is most important to cut deeply, otherwise the inflammatory tension and pain will persist. Syringe again with the warm lotion, dry out, and dress with a strip of sterile ribbon gauze partially soaked in bipp. The first dressing may remain for 48 hours, but should be changed daily afterwards. In cases where the furuncle has opened spontaneously a daily dressing of gauze or bipp is satisfactory. As lotions are frequently used in treating meatal inflammatory infections it is well to emphasise the risk that maceration of the epithelium may give rise to reinfection. All excessive moisture tends to macerate the skin, but mercurial or carbolic lotions are particularly liable to do so, especially the former.

Recurrences of furunculosis, in my opinion, are often due to the reinfection of denuded areas of skin, resulting either from the inflammatory process or the maceration of epithelium by some fault of the medicament or technique, which with care may be guarded against. However, despite every known precaution, recurrences will take place, when vaccine therapy promises the most effective line of attack. Autogenous vaccines, if obtainable, are the best, but if they are not available stock vaccines are worth a trial. I have seen excellent results from their use in some cases and from such small dosage as 50, 100, and 200 million staphylococci (*pyogenes aureus*) in successive weekly doses.

Diffuse Otitis.

Diffuse otitis is much less common than the furuncular form and is usually an accompaniment of an existing middle-ear suppuration. The treatment follows the same lines as that indicated already in the inflammatory indurations of furunculosis—namely, a sterile drainage-wick in the ear, fomentations, and, if suppuration occurs, surgical incision under general anæsthesia. In the form due to *Bacillus pyocyaneus* a perichondritis is present, but it never suppurates. It may last five or six weeks and tends to recur through reinfection, probably by the patient scratching the meatal orifice with the finger-nail. The organisms usually have their habitat in the axillæ and groins of persons of indifferent hygienic habits and surroundings. Frequent bathing and the application of a weak biniodide of mercury lotion to the groins and axillæ with the daily use of 3 per cent. silver nitrate drops in the ear is the best treatment. As hydrogen peroxide is now so commonly prescribed in the treatment of ear affections, it is interesting to note that if this is used in external otitis of pyocyaneus origin these organisms will flourish luxuriantly.

Acute Recurring Eczema.

Acute recurring eczema responds well to treatment. During the acute stage Lassar's paste (zinc oxide, pulv. amyl, lanolin and vaseline, each 2 dr.) should be applied on strips of muslin or lint (smooth side) over the pinna and in its folds and on a few inches of half-inch ribbon gauze lightly packed into the external meatus, night and morning. Gauze wick will prove useful as a drain from a middle-ear suppression, should such be present, until the condition of the external skin permits of the local use of lotions and drops. When the eczema has passed into the dry and scaly stage, 10 gr. of salicylic acid should be added to the ounce of Lassar's paste and applied direct to the affected area which may be otherwise left uncovered. As eczema of the pinna is invariably accompanied by seborrhœa of the scalp, which in the opinion of some dermatologists is the starting-point of the infective ear process, the scalp should be shampooed about twice a week, taking care to protect the ear from the water or shampoo liquid used. Soap spirit (sapo-mollis and spirit. vini rect. 2 oz. each) acts well, but much care must be taken to remove all traces of it by repeated rinsings of water. In less acute cases of deep meatal eczema (so often the starting-point of external otitis, diffuse and furuncular) the following method gives excellent results. If there is any loose skin débris about, remove it by gentle syringing or wiping out with wool with a solution of sodium bicarbonate, 2 dr. to the pint of warm water. Dry meatus and fill with a rolled pledget of wool soaked in the following preparation.

℞	Ung. hydrarg. nitr. dil.	1 dr.
	Liq. carbon. deterg.	10 ℥.
	Paraff. liq.	.. ad 1 oz.

This oily preparation should be brought into intimate contact with the meatal lining by pressing the tragus on to the wool several times. This wool should be removed and a small dry portion placed in the external orifice only.

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ST. MARYLEBONE HOSPITALS LEAGUE.—Mr. Walter Kewley, house governor of the Middlesex Hospital, calls attention to the work of the St. Marylebone Hospitals League, founded in 1922, and urges its imitation elsewhere. The fundamental principles of the League are the recognition of the obligation upon all people to support the hospitals and "appreciation of the fact that medical education, research work, and the training of nurses are primarily their most important functions"—that is to say, if there were no poor the hospitals would still be essential. To the preaching of this doctrine he ascribes the success of the League.

Special Articles.

THE OPENING OF THE NEW BRITISH MEDICAL ASSOCIATION HOUSE.

ON Monday last, July 13th, His Majesty the King opened the new home of the British Medical Association at Tavistock-square, London.

A full hour before the ceremony nearly all the delegates had taken their places in the Great Hall, and the square between the new memorial gates and the magnificent buildings was thronged with the representatives of the medical colleges and the nursing associations, along with visitors whose connexion with medicine entitled them to the honour of welcoming the King with his medical hosts. The band of the Grenadier Guards was already playing on the circular lawn, and alternated with a hidden string orchestra, also from the Grenadiers, whose music was relayed to the courtyard and the Great Hall by electrical amplifiers. Many visitors occupied a covered stand just outside the gates on the south side. At a quarter to three a guard of honour marched up—the Artists' Rifles—headed by a fife band in silver-grey, and took post along the short approach from Tavistock-square, which was brilliantly decorated with ornamental columns wound with flowers. At five minutes to three His Grace the Archbishop of Canterbury, escorted by the President, Mr. J. Basil Hall, the architect, Sir Edwin Lutyens, and seven of the leaders of the profession in Great Britain, offered prayer and solemnly dedicated the gates to the memory of the 574 members of the Association who gave their lives in the war. His Grace then took the key from the architect and opened the gates. The Guards played the hymn, "O God, our Help" before the dedication and "Abide with Me" as the gates swung open. The ceremony was impressive in its sincerity and restraint.

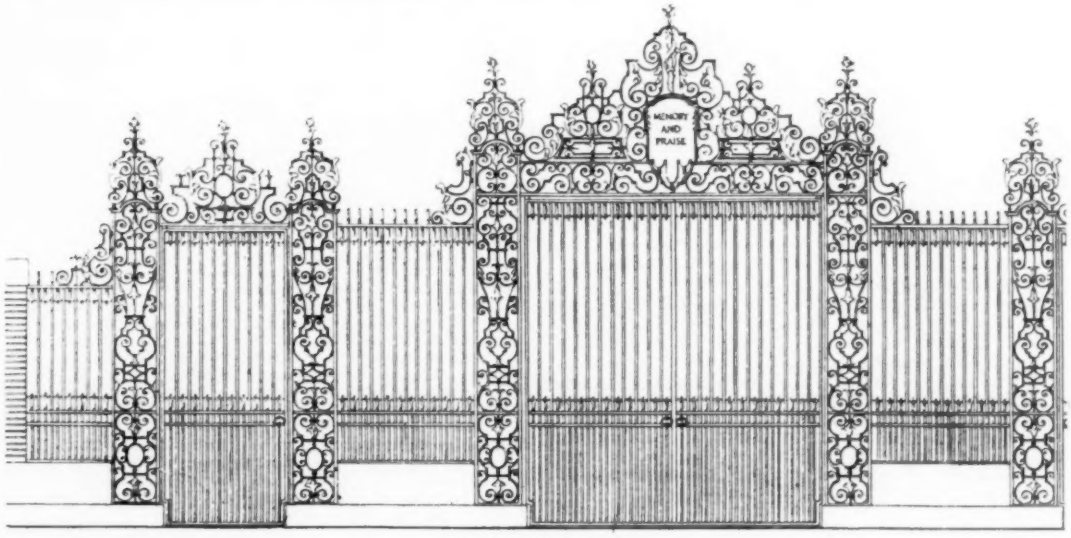
At ten minutes past three the King and Queen arrived with their attendants, accompanied by Mr. Neville Chamberlain, the Minister of Health. The Royal Standard broke from the flagstaff above the central pediment, and the Artists' band played the National Anthem. His Majesty then inspected the guard of honour, commanded by Captain W. Campbell Smith, M.C. The Minister of Health then presented the President of the Association, Mr. J. Basil Hall, of Bradford, and the Chairman of Council, Dr. R. A. Bolam, of Newcastle-on-Tyne; and the Chairman of the Council presented Dr. H. B. Brackenbury (Chairman of the Representative Body of the Association); Mr. N. Bishop Harman (Treasurer of the Association); Sir Donald MacAlister, Bart. (President of the General Medical Council); Sir Humphry Rolleston, Bart. (President of the Royal College of Physicians); Sir John Bland-Sutton, Bart. (President of the Royal College of Surgeons); Lord Dawson of Penn; Sir George Newman (Chief Medical Officer to the Ministry of Health); Sir Edwin Lutyens (the architect of the building); and Mr. F. J. Walton (the contractor). Those who had been presented then formed a procession and escorted the King and Queen through the courtyard and the main entrance to the Members' Reception Room. There the Royal visitors met the Reception Committee, and the Chairman of the Council presented Sir Dawson Williams, the Editor of the *British Medical Journal*, and other distinguished medical men and women, as well as the representatives of the workmen who had made the building, and the organising staff who had directed their work.

Courtyard of the British Medical Association House. [*Topical Press Photo.*

Meanwhile the Great Hall, with its cheerful white walls and friezes and its peacock-blue columns, held a crowded audience of delegates, who filled floor and gallery, their scarlet gowns and coloured hoods making a brilliant show. The procession mounted the dais to the enthusiastic singing of the National Anthem, and the Chairman of the Council welcomed His Majesty in an address in which he traced the history of the B.M.A. since it was founded by Sir Charles Hastings in 1832, set out its aims and scope, and mentioned its debt of gratitude to the King, who had succeeded his father King Edward as Patron.

His Majesty replied most sympathetically. He said he felt great pride at succeeding his Royal father as the patron of such a noble society, and paid tribute to the splendid work of the B.M.A. in selecting and training recruits to the professon, in criticising and

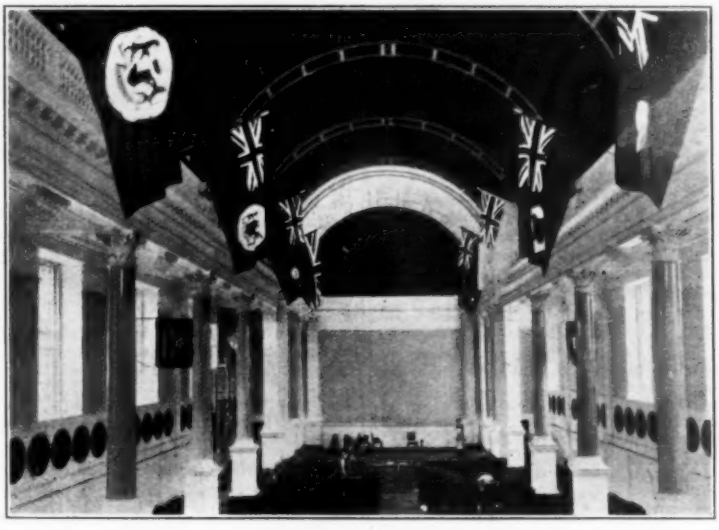
assisting research, in uniting the medical activities of the country, and in maintaining the very high standards that now governed the practice of medicine. Noble traditions were a priceless possession that must be not only maintained but constantly increased.



The Memorial Gates.

He admired especially the promotion of post-graduate study. He warned the profession of their deep responsibility for the general health of the country, and indicated the value of administration in maintaining sanitation in factories and public buildings and places and in preventing epidemic disease, and also of the informal education that the general practitioner can give the lay public in personal health and general hygiene.

He thanked the Association on behalf of the Queen for the reference to her interest in the practice of medicine by women, who were now active in all its branches. He expressed especial pleasure at the harmony he observed to exist between the Medical Association in this country and those in the Great Dominions of the Empire, and was honoured to welcome the representatives of America, France, Holland, Sweden, Norway, and Denmark.



The Great Hall.

Sir Edwin Lutyens then presented a master key to His Majesty, who declared the building open, and congratulated the members on their new and dignified home.

The Chairman of the Council then presented the representatives of the Home, Imperial, and Foreign Associations. The King and Queen then left the Great Hall and inspected the library, where the King accepted a copy of an illuminated Roll of Honour, the work of Mr. F. G. Hallett. After a tour of the building and grounds Their Majesties returned to the gates and took leave of the President and representatives of the Committee. Mr. Bishop Harman, the Treasurer, led the cheers as the Royal carriages drove off.

After the ceremony the building was open to inspection by the guests. As at present completed it covers an area of 18,000 square feet and has a total floor area of 58,000 square feet. It is built in an austere style of red brick with white stone facings, and is approached from Tavistock-square by a short roadway, which will, in due course, be bordered by wings extending out from the Association building. Beneath the Great Hall runs a vestibule connecting the Court of Honour with the entrance in Burton-street, so that cars are able to drive straight through after depositing their passengers. For the owner-driver there is ample covered parking room behind the building. In the centre of the Court of Honour is a circular grass plot curbed with white stone, while the corners are paved with flagstones. The gates are of wrought iron in an eighteenth-century design prepared by Sir Edward Lutyens, painted black, and surmounted by a bronze shield lettered in gold. The

inscriptions on either side of the shield are "Memory and Praise" and "Faithful hath been your warfare."

On either side of the passage-way lie beneath the Great Hall the members' lounge and library, the latter panelled with the rare Spanish mahogany familiar to members in the library at the old building. The former is finished in white and a delicate grey, with narrow black skirting. Beneath these rooms are large basements containing staff dining-rooms and storage offices. In the basement of the north wing is the Hastings Hall, capable of seating 150 persons, decorated in white and pale yellow and lighted by inverted bowls resting on gilt pedestals. Similar in design is the Council room in the basement of the south wing, fitted with tiered seats of green morocco, and lined with oak panelling bearing the names of past holders of the high offices of the Association. On the higher floors are committee rooms, office accommodation for the editorial, finance, and intelligence departments, and the printing offices.

If this ceremony is an omen of the future of the Association, no one need fear for British medicine. In its dignified brevity and order it splendidly expressed the unity and purpose of the B.M.A. They have set themselves a high standard, but no one can doubt that they will fulfil it.

BRITISH MEDICAL ASSOCIATION: ANNUAL MEETING AT BATH.

PROGRAMME OF THE SCIENTIFIC SECTIONS.

THESE sections will meet from 10 A.M. to 1 P.M. on Wednesday, Thursday, and Friday, July 22nd, 23rd, and 24th, for papers and discussions, and it is hoped that laboratory and clinical demonstrations will be arranged for the afternoons. The following sections will meet on each of the three days:—

Medicine.

President: Lord Dawson. Vice-Presidents: Dr. E. J. Cave, Dr. T. R. Elliott, Prof. J. A. Nixon, Prof. Adam Patrick, Dr. W. N. West Watson. Hon. Secretaries: Dr. James Lindsay, 1, The Circus, Bath; Dr. F. G. Chandler, 1, Park-square West, Portland-place, London, N.W. 1.

Provisional Programme.—July 22nd.—Discussion: Rheumatoid Arthritis, its Causation and Treatment. To be opened by Sir Humphry Rolleston, followed by Dr. Rupert Waterhouse (Treatment), Sir Robert Jones (Surgical), Dr. J. M. H. Monro (Bacteriology), Mr. A. G. Timbrell Fisher (Pathological), Mr. W. R. Ackland (Dental), and Sir William H. Willcox.

July 23rd.—Discussion: Hyperpiesis. To be opened by Lord Dawson; followed by Prof. E. H. Starling, Dr. H. Batty Shaw, Dr. Otto May, and Dr. Geoffrey Evans.

July 24th.—Discussion: The Uses and Abuses of Endocrine Therapy. To be opened by Dr. W. Langdon Brown and Prof. Swale Vincent; followed by Dr. H. Gardiner-Hill, Mr. Kenneth M. Walker, Dr. H. W. C. Vines, and Prof. F. S. Langmead.

Surgery.

President: Sir Berkeley Moynihan. Vice-Presidents: Mr. A. H. Burgess, Mr. Frederick Lace, Mr. H. S. Souttar, Mr. C. F. Walters. Hon. Secretaries: Mr. A. de V. Blathwayt, 6, Brock-street, Bath; Mr. A. L. Fuller, 9, Gay-street, Bath; Mr. R. M. Vick, 152, Harley-street, London, W. 1.

Provisional Programme.—July 22nd.—Discussion: Carcinoma of the Stomach. To be opened by Sir W. I. de Courcy Wheeler; followed by Dr. E. I. Spriggs (Clinical Manifestations and Early Diagnosis), Dr. A. F. Hurst (Auxiliary Methods of Diagnosis, Radiological and Chemical), Prof. M. J. Stewart (Pathology: General Relation of Carcinoma to Ulcer; Mode of Spread and Frequency of Secondary Deposits in Liver), Mr. J. Sherren, Mr. John Morley, Dr. J. A. Nixon, and Mr. A. H. Burgess.

July 23rd.—Discussion: Acute Intestinal Obstruction. To be opened by Sir William Taylor; followed by Mr. W. Sampson Handley and Mr. D. P. D. Wilkie. A general report and statistics from various hospitals for the past five years will be presented by Mr. H. S. Souttar (London Hosp.), Mr. R. P. Rowlands (Guy's), Mr. C. Max Page (St. Thomas's), Mr. R. M. Vick (St. Bartholomew's), Mr. L. R. Braithwaite (Leeds), Mr. G. Grey Turner (Newcastle), Mr. A. H. Burgess (Manchester), Mr. A. Rendle Short (Bristol), and Mr. A. B. Mitchell (Belfast).

July 24th.—Combined discussion with Orthopædic Section: Treatment of Fractures, with special reference to its Organisation and Teaching. To be opened on the Surgical side by Mr. G. E. Gask; followed by Mr. S. W. Daw, Mr. H. Wade, Mr. H. H. Sampson, and Mr. A. W. Sheen; and on the Orthopædic side by Sir Robert Jones; followed by Dr. R. Osgood (Boston, U.S.A.), Mr. H. Platt, Mr. H. A. T. Fairbank, Mr. C. Max Page, and Mr. Gwynne E. O. Williams.

Obstetrics and Gynæcology.

President: Lady Barrett. Vice-Presidents: Mr. H. S. Davidson, Mr. Eardley L. Holland, Mr. W. F. Rawson, Mr. D. C. Rayner. Hon. Secretaries: Mr. W. H. Duncan, 13, Gay-street, Bath; Dr. J. Bright Banister, 19, Harley-street, London, W. 1.

Provisional Programme.—July 22nd.—Discussions: (*a*) The Problems of Uterine Cancer. To be opened by Prof. B. P. Watson. (*b*) The Surgical Treatment of Malignant Disease of the Pelvic Organs. To be opened by Mr. Victor Bonney and Mr. S. J. Cameron. The following will take part in the discussions: Prof. C. Oldfield, Mr. H. J. D. Smythe, Dr. R. S. S. Statham, and Prof. W. C. Swayne.

July 23rd.—Discussion: The Treatment of Inoperable Cancer of the Pelvic Organs. To be opened by Dr. James Heyman (Stockholm); followed by Mr. Percival P. Cole and Mr. Malcolm Donaldson. Paper: Dr. D. C. Hare: Preliminary Investigation into the Circulatory Changes in Normal Pregnancies.

July 24th.—Discussion: The Rôle of Surgery in the Treatment of Backward Displacement of the Uterus. To be opened by Miss M. H. Frances Ivens; followed by Dr. H. Russell Andrews, Prof. J. M. Munro Kerr, Mr. R. H. Paramore, Mr. D. C. Rayner, Mr. D. Shannon, and Sir Henry J. F. Simson.

Pathology and Bacteriology.

President: Prof. J. C. G. Ledingham. Vice-Presidents: Dr. J. A. Braxton Hicks, Prof. E. H. Kettle, Dr. Rupert Waterhouse. Hon. Secretaries: Lieut.-Colonel James Cowan, 44, Combe-park, Bath; Dr. C. C. Okell, Wellcome Physiological Research Laboratories, Langley Court, Beckenham, Kent.

Provisional Programme.—July 22nd.—Discussion: Filter-passing Viruses. To be opened by Dr. W. E. Gye; followed by Mr. J. E. Barnard, Dr. Mervyn H. Gordon, Dr. S. P. Bedson, and Dr. J. E. McCartney.

July 23rd.—Discussion: The Pathological Basis of Treatment by Radiation. To be opened by Prof. S. Russ; followed by Dr. T. S. P. Strangeways, Miss M. E. Hume, and Dr. A. Piney.

July 24th.—Discussion: The Present Position of Pathology and Bacteriology in this Country, with special reference to Research. To be opened by the President of the section.

Neurology and Psychological Medicine.

President: Sir Maurice Craig. Vice-Presidents: Prof. Edwin Bramwell, Dr. Arthur F. Hurst, Dr. Norman Lavers, Dr. S. A. K. Wilson. Hon. Secretaries: Dr. Ray Edridge, 29, Gay-street, Bath; Dr. Edward Mapother, Maudsley Hospital, Denmark Hill, London, S.E. 5.

Provisional Programme.—July 22nd.—Discussion: Causation and Symptomatology of Multiple Neuritis. To be opened by Dr. T. Grainger Stewart; followed by Dr. James S. Collier, Dr. Wilfred J. Harris, Dr. W. Johnson, and Dr. F. J. Nattrass.

July 23rd.—Discussion: Treatment of Insomnia. To be opened by Dr. Robert Hutchison; followed by Dr. Harry Campbell, Dr. Henry Devine, and Dr. C. P. Symonds.

July 24th.—Discussion: Prophylaxis of Mental Disorder. To be opened by Sir Humphry Rolleston; followed by Dr. A. Helen A. Boyle, Dr. Bernard Hart, Dr. Edward Mapother, and Dr. T. A. Ross.

Therapeutics (including Balneology and Radiotherapy).

President: Prof. R. B. Wild. Vice-Presidents: Dr. Preston King, Dr. W. Mitchell, Dr. Nathan Mutch. Hon. Secretaries: Dr. Cecil H. Terry, 15, The Circus, Bath; Dr. Dorothy C. Hare, 1, Bickenhall Mansions, London, W. 1.

Provisional Programme.—July 22nd.—Discussion: Treatment of Asthma. To be opened by Dr. W. Langdon Brown, followed by Dr. E. P. Poulton, and Dr. P. Hamill.

July 23rd.—Discussion: Treatment of Chronic Arthritis. To be opened by Sir Thomas Horder; followed by Dr. Preston King (Balneology), Dr. N. Mutch, and Dr. C. B. Heald.

July 24th.—Discussion: Therapeutic Value of Light. To be opened by Prof. W. E. Dixon; followed by Dr. C. E. M. Jones (Clinical) and Dr. G. H. Lancashire. Paper: Dr. Newman Neild: The Uses of Posture for Bronchial Drainage,

Laryngology, Otology, and Rhinology.

President: Mr. Arthur H. Cheatle. Vice-Presidents: Mr. Neil Maclay, Dr. Irwin Moore, Mr. Sydney R. Scott. Hon. Secretaries: Mr. H. N. Barnett, 27, The Circus, Bath; Dr. R. Scott Stevenson, 30, New Cavendish-street, London, W. 1.

Programme.—July 22nd.—Discussion: Overlooked Cases of Foreign Body in the Air and Food Passages. To be opened by Prof. Chevalier Jackson (Philadelphia); followed by Dr. Thomas McCrae (Philadelphia), Sir StClair Thomson, and others. Prof. Chevalier Jackson: (*a*) Demonstration on the Extraction of Foreign Bodies from the Air and Food Passages; (*b*) Cinematographic demonstration of Bronchoscopic Aspiration for Suppurative Diseases of the Lung of other than Foreign Body Origin. Dr. T. McCrae: Bronchoscopy for Disease. Mr. V. E. Negus: Evolutionary Factors in Causation of Pharyngeal Diverticula. Dr. Irwin Moore: An Outline of the History of Endoscopy.

July 23rd.—Discussions: (1) Operative Treatment of Chronic Middle-ear Suppuration. To be opened by Mr. G. J. Jenkins; followed by Mr. Sydney R. Scott, Mr. J. S. Fraser, and Mr. J. Bowring Horgan. (2) Treatment of Chronic Non-suppurative Middle-ear Deafness (excluding Oto-sclerosis). To be opened by Sir William Milligan; followed by Dr. J. Kerr Love, Sir Robert Woods, Mr. Neil Maclay, and Mr. H. Norman Barnett.

July 24th.—Discussion: Occupational Diseases of Ear, Nose, and Throat, and their Prevention. To be opened by Mr. F. H. Westmacott; followed by Surgeon-Commander S. W. Grimwade, Wing-Commander D. Ranken, Mr. T. Jefferson Faulder, Mr. C. A. Scott Ridout, and Mr. T. Ritchie Rodger.

The following Sections will each meet on two days:—

Diseases of Children.

President: Dr. Robert Hutchison. Vice-Presidents: Dr. Carey F. Coombs, Mr. P. T. Crymble, Dr. Charles McNeil, Dr. Reginald H. Miller. Hon. Secretaries: Dr. Vincent Coates, M.C., 10, The Circus, Bath; Mr. R. A. Ramsay, 123, Gloucester-terrace, Hyde Park, London, W. 2.

Provisional Programme.—July 22nd.—Joint discussion with the Section of Public Medicine: Rheumatic Infection in Childhood—Early Diagnosis and Preventive Treatment. To be opened by Dr. F. J. Poynton and Dr. R. A. Askins (M.O.H. Bristol); followed by Dr. Carey F. Coombs, Dr. Reginald Miller, Dr. J. A. Glover (Ministry of Health), and Dr. Vincent Coates.

July 23rd.—Discussion: Treatment of Empyema. To be opened by Dr. H. C. Cameron and Mr. H. S. Souttar; followed by Dr. F. G. Chandler, Mr. H. W. C. Romanis, and Mr. T. Twistington Higgins.

Ophthalmology.

President: Dr. W. Mardon Beaumont. Vice-Presidents: Dr. R. Wallace Henry, Mr. A. W. Ormond, Mr. C. H. Walker. Hon. Secretaries: Dr. R. Colley, 30, The Circus, Bath; Mr. P. G. Doyne, 8, Harley-street, London, W. 1.

Provisional Programme.—July 22nd.—Discussion: Eye Injuries and Interstitial Keratitis. To be opened by Mr. W. T. Holmes Spicer.

Papers: Mr. A. W. Ormond, Visual Hallucinations of Sane People. Mr. N. Bishop Harman: Phlyctenular Conjunctivitis and Keratitis—Causes and Prevention. Dr. R. Wallace Henry: Instrument for Recording Light Minimum and Light Difference. Dr. R. Colley: Case of Perforating Wound of Eye with Retention of Piece of Glass.

July 23rd.—Discussion: Ocular Pain. To be opened by Mr. A. Freeland Fergus.

Papers: Mr. C. H. Walker: Amaurosis. Mr. Lindsay Rea: Treatment of Ocular Syphilis. Mr. J. Burdon-Cooper: Conservative Treatment of Glaucoma.

Orthopædics.

President: Prof. E. W. Hey Groves. Vice-Presidents: Dr. Naughton Dunn, Mr. G. R. Girdlestone, Mr. E. Muirhead Little. Hon. Secretaries: Dr. J. S. Lævis, M.C., 20, Gay-street, Bath; Mr. T. Twistington Higgins, 27, Harley-street, London, W. 1.

Provisional Programme.—July 23rd.—Discussion: Tuberculous Disease of the Spine. To be opened by Prof. Calvé (Paris); followed by Mr. G. R. Girdlestone, Mr. W. T. G. Pugh, and Mr. James Russell.

July 24th.—Joint discussion with Section of Surgery on the Treatment of Fractures, with special reference to Organisation and Teaching. (See above.)

Public Medicine.

President: Dr. T. Eustace Hill. Vice-Presidents: Dr. T. W. Naylor Barlow, Dr. J. F. Blackett, Dr. W. A. Brend, Dr. S. Noy Scott. Hon. Secretaries: Dr. R. E. Thomas 11, Darlington-place, Bath; Dr. A. Neville Cox, 21, Cornwall-gardens, Preston Park, Brighton.

Provisional Programme.—July 22nd.—Joint discussion with the Section of Diseases of Children: Rheumatic Infection in Childhood—Early Diagnosis and Preventive Treatment. To be opened by Dr. F. J. Poynton (Children's Section) and Dr. R. A. Askins, School Medical Officer and M.O.H. Bristol (Public Medicine Section).

July 23rd.—Discussions: (1) Food Manipulation in Relation to Health. To be opened by Dr. W. G. Savage. Dr. C. E. Goddard will speak with special reference to Accidental Contamination. (2) Influence of Sunlight and Artificial Lights on Health, including Smoke Pollution. To be opened by Dr. Leonard Hill; followed by Dr. G. B. Dixon, who will speak particularly on the Influence of Light on Tuberculosis, and Dr. Dora C. Colebrook.

The following Section will meet on one day:—

Medical Sociology.

President: Dr. Charles E. S. Flemming. Vice-Presidents: Dr. J. W. Bone, Mr. Wilfred Buckley, Mr. G. P. Male, Dr. E. A. Starling. Hon. Secretaries: Dr. C. A. Marsh, The Roseries, Englishcombe, Bath; Dr. C. J. Buchan, 326, Brownhill-road, Catford, London, S.E. 6.

Provisional Programme.—July 24th.—Morning.—Discussion: What should be the Standard of Purity of Milk? To be opened by Dr. R. Stenhouse Williams, from the point of view of the bacteriologist; Dr. W. G. Savage, from the point of view of the medical officer of health; and Dr. Eric Pritchard, from the point of view of the dietist. Afternoon.—Discussion: By What Means can Pure Milk be Obtained, and the Cost? To be opened by Mr. Wilfred Buckley (National Clean Milk Society), as a producer; Mr. G. P. Male, as a veterinary surgeon; and Mr. J. H. Maggs (chairman, United Dairies), as a distributor. Two films will be shown with the following titles: Production of Certified Milk on an English Farm, and Handling and Distribution of Milk in New York City.

THE BRITISH SOCIAL HYGIENE COUNCIL

(LATE NATIONAL COUNCIL FOR COMBATING VENEREAL DISEASES).

THE British Social Hygiene Council held their tenth annual meeting on July 9th in the Robert Barnes Hall of the Royal Society of Medicine. Sir Auckland Geddes delivered the presidential address.

Annual Meeting.

The President, in his opening remarks, paid a tribute to his predecessor, Lord Trevethin, who had done so much to combat venereal disease. He went on to point out the unusual interest of the occasion: the Council was now looking back over 11 years of activity and difficulty during which great progress had been made. Between the years 1920 and 1924 the numbers of new cases of syphilis at the treatment centres had fallen from 43,000 to 22,000, while the number of attendances had risen from under 1,500,000 to 1,645,000. It was clear from these figures and others that venereal disease had been combated in this country with increasing success, though the end was not yet in sight. The British Social Hygiene Council, coöperating with the Ministry of Health and the local authorities, had done a great deal towards this result. In order to determine the aims of the Council for the future it was necessary to consider what the reduction of venereal disease would mean not only for the present generation but for posterity. The figures quoted showed that the number of new infections had definitely diminished, so that every unborn child had a proportionately greater chance of escaping infection. The Council looked forward over a vast field of effort, and while they saw clearly that medical work against venereal disease was profoundly important and was progressing rapidly, yet the problem had many other aspects. There was no group of diseases in which medical, social, and moral problems were so inextricably interwoven, and medicine could not achieve victory over venereal disease by itself. The change in their

title showed that the Council had greatly enlarged their scope and they now aimed to preserve and strengthen the family. It was very necessary in these days to impress upon the conscience of the people that the family was the basic social unit. No one who took thought for the future of the country could fail to realise that the foundation of its greatness was the health of its stock, and so the British Social Hygiene Council appealed to all the citizens of the Empire and of other countries to secure that future generations should be uncontaminated by a preventable and curable disease.

The Council aimed at promoting a high standard of sex conduct. Sexual morality was closely connected with housing, and the horrible conditions under which human beings were herded together went far to explain the present low standard of morality. The Council joined hands with all who worked to improve the conditions of life, housing, recreation, and the whole environment of those who were compelled from poverty to live under conditions sometimes too dreadful to describe. The medical attack must be strong, thorough, and frank, but they would have to make every effort to improve the lives of the people.

The Viscount Illingdon, a Vice-President of the Council, and Chairman of the Indian Council, pleaded for an extension of their work in the British Empire and particularly in India, which contained three-quarters of the Empire's population and where the high incidence of venereal disease was very serious. He thanked the Indian Medical Services for the work they had done in fighting venereal disease in India and hoped that the Government departments would assist in every possible way to eliminate it, though he realised that they had to contend with great difficulties.

Mrs. Garlin Spencer, a Director of the Board of the American Social Hygiene Association, described the evolution of similar social work in America.

Official Banquet.

In the evening a dinner was held at the Hotel Cecil to celebrate the successful results of 11 years' work and to initiate the broader policy. After the loyal toasts had been honoured the health of the British Social Hygiene Council was proposed by Lord Merrivale, President of the Divorce Court, who spoke of the "conspiracy of silence" which had surrounded the "social evil" in his youth and of the courage with which the present generation was breaking that silence and attacking that evil. He saw in this new attitude, reflected in the new name of the Council, a possibility of success that had not existed in the old days.

Sir Auckland Geddes, responding to the toast, recalled the national stocktaking in the days of the war and the realisation of the heavy toll venereal disease was then taking of the country's health, strength, and vitality.

The health of the guests was proposed by Mr. Greaves Lord, K.C., M.P., in the absence of Mr. J. Wheatley, M.P. He said that the greatness of England depended on the performance by each generation in turn of its duty to posterity, and no greater work for the future could be found than that of the Council of Social Hygiene.

Surgeon Vice-Admiral J. Chambers, Medical Director-General of the Navy, in responding, gave a brief account of the very successful results of instruction in the home water fleet and the great fall in the incidence of venereal disease in the mercantile marine. The reports from foreign waters, especially the Far East, were less satisfactory.

The toast of the "Associated Organisations" was proposed by Mrs. Scharlieb, M.D., who described the correlation of the work in England, America, Canada, Australia, and South Africa. Mrs. Scandrett (South Africa), Mrs. Anna Garlin Spencer (America), and Dr. Kendal Bates (Canada) replied, and the proceedings concluded with the health of the President, proposed by Mr. E. B. Turner.

SOCIETY FOR THE PREVENTION OF VENEREAL DISEASE.

THE sixth annual general meeting of the Society for the Prevention of Venereal Disease was held at 12, Stratford-place on July 8th. The President of the Society, Sir Auckland Geddes, occupied the chair, and said there had been a very great reduction in venereal disease, amounting to nearly 50 per cent., within the last five years. He did not think any one organisation could claim that this reduction was the result of their labours alone, for all who had taken part in attempting to educate the people as to the importance and dangers of venereal disease and in teaching the public how to prevent the disease might say they had contributed to this great improvement. He said that he believed that fusion between the British Social Hygiene Council and the Society for the Prevention of Venereal Disease was undesirable because, although both the societies had accepted the Trevethin report, they had accepted it with quite different emphasis laid upon the different recommendations. He thought that when dealing with such a subject as venereal disease it was inevitable that those at the one extreme of thought would find it impossible to understand the point of view of those at the other extreme of thought, although both extremes and those between them were working for the same end. He considered that the Society for the Prevention of Venereal Disease had got hold of a very important part of the work which has to be done. What they desired to see was that the causal organisms of the different diseases should be destroyed whenever and wherever they might be found, and that this matter should be dealt with unsentimentally, and though there was a wide field for coöperation with those who laid the emphasis on the moral and emotional side, an attempt to get all who are working for the prevention of venereal disease into one society would result in a great loss. In the belief that the continuance of the two organisations is good and that it is really better than fusion, he had, after careful consideration, accepted the position of President not only of this Society but of the other society, believing that in that way, although the societies continued as separate and independent bodies, it would be possible to present a united front to the Government or the Department of State concerned. He thought that it would be wise for the Society to concentrate upon getting a definite reply from the Ministry of Health in the coming months, and he proposed that the resolution before the meeting should be laid before the Government in the autumn in the following terms:—

"That this meeting with great respect urges the Government to give effect without further delay to the recommendations contained in the Trevethin Report, which the Minister of Health has stated have been accepted in principle, and further begs to call the attention of the Minister of Health to the resolution submitted to the Ministry of Health at the annual general meeting of the Society in July, 1924, requesting the allocation to the Society for the Prevention of Venereal Disease of an equitable proportion of any sum set aside for the education of the public regarding venereal disease and its prevention, to which no reply has yet been received."

Mr. Wansey Bayly, honorary secretary of the Society, reported the work of the Society during the past year, and said that a new situation had arisen owing to Sir Auckland Geddes having accepted also the presidency of the British Social Hygiene Council, but their Society would do their best to help him in this new situation. Important progress had been gained during the last year by Sir Auckland Geddes's double appointment and by the acceptance of the principle of immediate self-disinfection by the British Social Hygiene Council. He added that the Ministry of Health had acknowledged that the evidence of witnesses before the Trevethin Committee was available for reference or publication.

Mr. Harry Machin presented the financial report and annual audit.

Lady Askwith, in seconding the resolution, said she thought many of the members of the Society would agree that Sir Auckland Geddes was right in maintaining that fusion between the two societies was not possible or desirable, and she was also sure that there would be nobody who did not feel perfectly safe in the hands of Sir Auckland Geddes as President of both organisations.

Mr. Basil Peto, M.P., in supporting the resolution, expressed his pleasure in hearing that the President had also taken the position of President of the other society, and he entirely agreed with the conclusion reached that fusion would not have been a source of strength, but the best possible liaison between the two societies was to have one head for both. It was, he reminded the audience, two years since the committee presided over by Lord Trevethin reported, but no steps had been taken to carry out what their Society regarded as the most important part of the report, that dealing with the sale of the necessarily simple preventive disinfectants at chemists' shops.

Mr. A. J. Bennett, M.P., said that the Society could not expect to obtain all their revenue from a very limited number of persons, and that it was only right they should try to get funds from the public.

The resolution was put to the meeting and carried unanimously.

CONVENTION OF ENGLISH-SPEAKING OPHTHALMOLOGICAL SOCIETIES,

LONDON, JULY 14TH–17TH.

OPENING SESSION.

THE formal opening of the Convention took place in the Memorial Hall, University College, on Tuesday morning, when speeches were delivered by Mr. Neville Chamberlain, Minister of Health, and Mr. Houghton, the American Ambassador.

Addresses of Welcome.

The Minister of Health first referred to the hiatus produced in the holding of large, and especially international, congresses by the Great War, and said that though the members of this Congress would regret the absence of the wider scope and the more varied treatment which would be derived from the attendance of delegates from all over the world, there was some compensation in the fact that the language which would be used would be understood by all. He alluded with satisfaction to the striking advances which had been made in ophthalmology in the last 70 years, particularising the discoveries relating to the powers of accommodation and the accuracy of the instruments now available. He also referred to the great attention being given to the eyesight of children, and the energy with which ophthalmic clinics, 482 in number, were being conducted. Such attention was increasingly necessary with the ever augmented stress and hustle of the life of cities. He warmly commended the spirit which had resulted in the organisation of this Congress, and which would bring about improved knowledge in regard to the preservation of the function of the most precious of all the special senses.

The American Ambassador (Mr. Houghton) expressed, on behalf of the American visitors, appreciation of the welcome which had been accorded them by the Minister of Health, and humorously warned his compatriots to beware of the elaborate hospitality prepared for them by the organisers of the Convention. He also affected an anxiety about the welfare of the population of the States with so many of the country's eye surgeons in a foreign land.

The following representatives of visiting bodies were then presented to Mr. Chamberlain, and delivered short speeches expressing the satisfaction which it gave them to be present: Dr. G. E. de Schweinitz (American Ophthalmological Society), Dr. W. R. Parker (Ophthalmological Section of the American Medical Association), Dr. L. M. Francis (American Academy of Ophthalmology and Oto-Laryngology), Dr. W. G. M. Byers (Montreal Ophthalmological Society), and Dr. A. J. Hall (New Zealand Branch of the British Medical Association).

Presentations.

The President, in presenting the Nettleship Prize to Prof. S. E. Whitnall, of Montreal, for his monumental work on the anatomy of the orbit, said Edward Nettleship and Sir William Bowman both left deep footprints in the sands of time. In memory of the latter had been established the Bowman Lecture, and to commemorate the name of Nettleship his friends had established a prize for the encouragement of ophthalmic work, to be awarded triennially. It was, the President said, a great pleasure to him that Prof. Whitnall had been able to come from Montreal to receive the award at his hands.

Prof. Whitnall, in a few words of thanks, said it was a real pleasure to him to be able to renew friendships which were formed in the early days of the Oxford ophthalmological congresses, where the friendly talks on ophthalmological subjects were the mainsprings of any subsequent work he felt called upon to do in relation to the eye.

Mr. W. T. Holmes Spicer then presented to the President the Critchett Memorial Presidential Badge. It was, he said, Sir Anderson Critchett's father, George Critchett, who lived through the great time of ophthalmological discovery and research, that blossoming time when the ophthalmoscope was discovered, and father and son had together practised the specialty for nearly 100 years, probably a record of its kind. George Critchett was not a prolific writer; his chief energies were clinical, and the devising of operations for various ocular conditions. Sir Anderson Critchett was born in an atmosphere in which he might be said to have lisped ophthalmology. But he had the disadvantage in early years of a divided allegiance, for he was devoted to music and was the possessor of a fine voice, hence his singing was in great request. There came a time when his father told him he must make his choice; he must either be a singer or a surgeon, and the world knew what the choice was. To his credit it must be said that though formerly he was continually singing at concerts, when he decided on his life's career he never sang again in public. Mr. Spicer paid a high tribute to Sir Anderson Critchett's fine qualities, social and professional, and then invested the President with the badge, beautifully worked in gold, and bearing portraits of George and Anderson Critchett, with a Latin inscription. He wished the President a long life and a continuation of the fine work which he had been doing during the last forty years.

THE PRESIDENT'S ADDRESS.

The Elimination of Eye Disease.

Mr. Treacher Collins then delivered his presidential address. His purpose, he said, was simply to present a few historic facts which, aided by imagination, would enable a peep to be taken through a hole in the curtain of the present and gaze at some wonders that might come to pass. For the elimination of disease it was essential to know everything concerning the working mechanism of the organism and the varying conditions of its environment; and owing to recent work it had now become possible to contemplate the elimination of some eye diseases in the human organism. In *leprosy* the eyes were frequently affected and the sight destroyed. Probably many cases of the disease were brought there by the returning Knights Templar and their retinue, among whom lack of cleanliness was regarded as a virtue. To the segregation of the affected was probably due the absence of more serious spread. But there were still 300,000 cases of leprosy in the British Empire.

With regard to *small-pox* three-fourths to one-half of the indigent blind applying for relief in the last century in this country lost their sight through this disease, but in 1922 the Departmental Committee on the causes and prevention of blindness could only discover six cases due to it in asylums for the blind.

Much of this improvement was due to the greater care now paid to the eyes in critical pyrexial diseases, as well as to the reduction in the number of cases of small-pox.

Speaking of *ophthalmia*, Mr. Collins mentioned the work done on the modes of transference of the disease. The causal organisms did not produce spores, and drying killed them, hence infection was only likely to occur while the eyes were in a moist state. No specific microbe had been identified with the worst form of ophthalmia—namely, trachoma—but it was probable that this virus also was killed by drying; and general measures based on this had largely eliminated this disease from the British Army and from the Poor-law schools of London, where at one time it was rife. A tribute to the cleanliness of the modern British soldier was that the Egyptian Expeditionary Force fought its way along the same route as did the trachoma-infested Napoleonic troops without contracting it, but when large numbers of Turks were taken prisoner they were found to be severe sufferers from trachoma with corneal complications. At an inspection made by Nettleship of the Poor-law schools of London in 1874, 42 per cent. were found to have granular lids or trachoma, but in 1896 Sydney Stephenson found the figure reduced to 4·91 per cent. The disease was virulently contagious, and liable to rapid spread in favouring conditions.

The protean manifestations of *syphilis* were one of the commonest causes of eye disease in this country; the departmental committee already referred to considered that from 10 per cent. to 15 per cent. of the blindness of the country was due to this disease. Mr. Collins did not share a hopeless view as to the elimination of syphilis among the community; in this contest between man and the spirochæte the odds were undoubtedly on man. An encouraging stage was reached when the appointment of the Royal Commission on the subject broke down the conspiracy of silence which until then had surrounded it. In 1920 105,185 infected people presented themselves at the official treatment centres, and in 1923 the number had declined to 73,613; and a similar fall had occurred in other countries where similar facilities were provided. He thought that in respect of the wilful transfer of these diseases to others the punishment should be made to fit the crime—namely, incarceration and treatment until the convicted person could be declared free from the infection.

Concerning *iritis* in the last 25 years a great change of view as to the ætiology had taken place. What had been described as "rheumatic iritis" was very rarely associated with acute articular rheumatism: the commonest form of joint affection found in association with iritis was gonorrhœal, a disease which was present in 15 per cent. of the cases.

The recognition of *metastatic septic infection* as a cause of iritis was largely due to the work of Mr. William Lang, who found that in 37 per cent. of his cases of iritis pyorrhœa was the sole ascertainable cause; certainly rapid recovery of the iritis followed removal of the affected foci, no other treatment but heat and atropine having been used. If more mouths were kept clean and if it was realised that a gold-crowned tooth could harbour bad septic foci, the total amount of intra-ocular inflammation would be materially reduced.

It was not possible to say as a result of statistics whether *tuberculous* eye disease was diminishing, but both here and in America there had been noted a steady reduction in the amount of respiratory tuberculosis, and the death-rate from it showed a bigger drop than in any other period of which there were authentic records. He alluded to the great improvement in the condition of cases of tuberculous eye disease when they were removed from their homes to Swanley Ophthalmia Schools, and this he attributed to the sunshine and out-of-door life, and the good food and ample playing spaces.

The elimination of *phlyctenular* ophthalmia and keratitis was a social problem, being bound up with over-population and living in congested conditions. He referred to the importance of the diet including fat-soluble A vitamin, especially in the obviation of xerophthalmia and keratomalacia, the latter, however, being but a rare disease in this country.

Certain *hereditary diseases of the eye* seemed to be chiefly due to a tissue degeneration; such was retinitis pigmentosa, a condition which was very resistant to every known treatment. And it was regrettable that the parents suffering from this disease were the reverse of sterile. It would be a proper course to advise sufferers who had married to refrain from bearing progeny.

Myopia Mr. Collins considered to be largely the outcome of our present system of education. It seemed altogether unnatural that the young growing (human) animal should be compelled to spend hours daily poring over books, often in artificial light, and educational authorities were remarkably slow in taking advantage of other educative means, such as the epidiascope, oral teaching to a greater extent, broadcasting, and the use of the lantern. Lessons in geography, for instance, could be converted into a veritable voyage of discovery for the young mind.

In conclusion the President referred to the work which had been done in the seven years of its existence by the Council of British Ophthalmologists, which was formed to assist Government Departments and other persons in regard to its special subject. The United States now had a parallel body with very similar aims. He also referred to the work of the new International League of Red Cross Societies, and to that done by the Health Department of the League of Nations, the latter having conducted investigations likely to have far-reaching results. Disease, he said, was the common foe of all nations, and active coöperation on the part of all of them was required in order to build up a more moral, more intellectual specimen of *Homo sapiens* than that now striding the earth, pluming himself on being the lord of creation.

BRITISH EMPIRE CANCER CAMPAIGN.

ANNUAL MEETING.

THE second annual report of the Grand Council of the British Empire Cancer Campaign was presented by the chairman, Viscount Cave, at a meeting held at the House of Lords on Monday, July 13th, when a message was read from the Duke of York, President of the Campaign, wishing success to its labours. The campaign, which came into existence in the spring of 1923, has had at its disposal a sum of just over £100,000, which has enabled the Council to assist existing cancer research institutions to maintain their work at maximum efficiency as well as to initiate and devise fresh lines of research. A concerted effort is being made to obtain trustworthy statistics of cancer from outlying parts of the Empire. Help is being freely given to expensive and difficult research in connexion with the causation and treatment of cancer by means of radium, X and other rays, carried on jointly with the Radiology Committee of the Medical Research Council. Radium to the value of £5000 has been purchased and put at the disposal of this joint committee, while the Radon Centre at the Middlesex Hospital has undertaken the production and supply of radium emanation. Lord Cave concluded his review of the year's activities with the warning that only by continuous and patient effort can knowledge be increased and results achieved. At the Council meeting which followed Dr. J. A. Murray, of the Imperial Cancer Research Fund, and Lieut.-Colonel A. B. Smallman, secretary to the Departmental Committee on Cancer, were invited to join the Intelligence Committee of the Campaign.

The report contains a summary of the work of the various committees of the Campaign. During the year the Financial Committee announces an income from donations and collections of £31,168, plus £2606 bank interest, out of which £2380 have been used up in administration and £3361 in appeals, a percentage—

be it noted—of only 9·2 of the total funds raised during the period. £280 have gone to travelling and incidental expenses of committees and lecturers, while grants for research work have totalled £16,170. Grants are made on the recommendation of a Scientific Advisory Committee appointed jointly by the Royal Society, the Medical Research Council, and the Cancer Campaign. Institutions have benefited as follows: £3725 to the Medical Research Council (Radon Centre at Middlesex Hospital), £6900 to the Middlesex Hospital (Cancer Research Department), £5000 to the Cancer Hospital Research Institute, £1695 to St. Bartholomew's Hospital (Radiological Cancer Research Department), £1000 to Christie Hospital, Manchester, £600 to St. Mark's Hospital, London, £200 to Coombe Lying-in Hospital, Dublin, £1500 to the Tropical Disease Prevention Association, and £5000 to the purchase of 800 mg. of radium for cancer research divided between St. Bartholomew's Hospital, St. Peter's Hospital, and the Medical Women's Federation. Individual grants have been made to Dr. Thomas Lumsden (Lister Institute), Dr. Malcolm Donaldson, Dr. Louis Sambon, Dr. J. C. Mottram (Radium Institute), and Mr. I. Hieger, B.Sc. (Cancer Hospital Research Department).

A notable change has been effected in the organisation of cancer research at the Middlesex Hospital, where the scientific departments have been invited to initiate cancer research along their own special lines under the supervision of Prof. J. McIntosh (pathology), Prof. S. Russ (physics), and Prof. E. C. Dodds (biochemistry). At the Cancer Hospital a scheme of work has been initiated under the five headings of: (1) experimental production, (2) clinical and surgical pathology, (3) immunity experiments, (4) experiments in chemotherapy, (5) statistical inquiries. An interesting research has been in progress to test the effect of prolonged administration of food preservatives on animals; so far small amounts of boron, tin, and copper oft repeated have had no appreciable ill effect on mice and rats. At St. Bartholomew's Hospital a special X ray research department has been set apart for investigating malignant disease of the breast, the upper air passages and pharynx, and the uterus. At Manchester a local cancer committee will shortly take over the general management of research in the various institutions; a questionnaire has been issued in order to trace the history of all cancer patients in the city. At St. Mark's Hospital the outcome of some recent work suggests the important part played by lymphoid follicles of the intestine in the protection of the body against cancer. Dr. Lumsden's work at the Lister Institute on an antiserum, selective for particular cancer cells, is familiar to our readers and is being continued. The grant to the Tropical Disease Prevention Association for investigation of cancer in relation to parasites carries the proviso that cancer material, both animal and human, and specimens of parasites shall be brought back to this country for investigation.

The report, which contains much else of interest, bears striking testimony to the wide range of inquiry instituted by the British Empire Cancer Campaign, the address of which is 19, Berkeley-street, London, W. 1.

THE BATEMAN APPEAL.

As already explained in THE LANCET, it has been felt that material assistance ought to be offered to Dr. Bateman to meet the legal expenses of his successful appeal and to make good the deficiency in his professional income. Accordingly the Bateman Fund has been opened and lists of contributions have appeared in recent issues. We have received additional contributions as follows:—

	£	s.	d.
Already received and acknowledged ..	493	3	0
Drs. Gerrard, Bickford, and Cloake ..	3	3	0
Dr. E. W. Dewey	1	1	0
Dr. Mary Kidd	0	10	0
Dr. Mohammed Eid	0	10	0
	£498	7	0

PARIS.

(FROM OUR OWN CORRESPONDENT.)

Heart Cinematography.

PHYSICIANS are finding that disorder of rhythm is an increasingly valuable guide in the diagnosis and treatment of heart trouble, and its value is proportioned to the accuracy with which it can be observed. Auscultation is useful, but some method of recording the movements is essential for precise observation. The thoracic cage hides a living heart from sight, and few practitioners have time to study artificial contractions in the laboratory. Mr. Lutembacher's method of filming the isolated and perfused heart therefore fills a pressing need. He has already used his device to show his students the more common rhythmic disorders and to help them to understand the electro-cardiographic curves taken at the same time as the moving photograph. The next step is to use this method to examine the direct action of cardiac remedies. Marey has already used it to observe the contraction of voluntary muscles.

Narcotic Poisoning.

Dr. Ch. Achard recently reported to the Academy of Medicine five cases of suicidal narcotic poisoning of which two were fatal. Four were due to dial and one, which recovered, to veronal. A clinical phenomenon worthy of note was the very marked muscular hypotonus observed in these cases, contrasting with the brisk reflexes, Babinski's sign even being obtained. In one case catatonic attitudes appeared; in another a syndrome recalling that of disseminated sclerosis, slurring speech, ataxia, fine intention tremor, and nystagmus; in a third case the pupils were fixed. The growing frequency of these cases of poisoning proves the necessity for regulating the sale of narcotic drugs.

The Efficacy of Vaccination and the Virulence of Small-pox.

Dr. Alcay, of Nîmes, has just published some important statistics of the epidemic of small-pox in Switzerland in 1921. The form of the infection was mild and vaccination was completely protective. The German cantons, where vaccination is voluntary, were all swept by the disease, those where it is obligatory escaped altogether. Emergency vaccination measures were successful in stamping out the epidemic wherever they were applied. Such evidence of the value of compulsory vaccination ought to have persuaded the Federal Council to impose it on the whole country, but the Government, remembering the difficulties encountered in a similar attempt in 1882, and also considering the mildness of the infection, only ordered vaccination for certain groups of the population. These half measures cost Switzerland several thousands of sick people and a few deaths, but the results would have been very grave if the epidemic had had the usual severity of small-pox.

Dr. A. Netter has recently drawn the attention of the Academy of Medicine to the frequency of small-pox and the tendency of the disease to take a benign form. The condition seemed about to disappear from civilised countries, but during the last few years has shown an unexpected recrudescence, particularly in Switzerland and England. In the former country only 14 cases were registered between 1915 and 1920, but the numbers rose abruptly to 596 in 1921, 1159 in 1922, and 2145 in 1925. They fell again in 1924 to 1245, and in the first five months of 1925 to 156. In England and Wales 7 cases were recorded in 1917 and 63 in 1918. In 1919, 1920, and 1921 there were 311, 280, and 336 cases respectively; in 1922 there were 973, in 1923 2054, and in 1924 3395. Already 3008 notifications have been received for 1925. In both these countries anti-vaccination influence has been at work. In Switzerland it has succeeded in removing the regulation of vaccination from the hands of the Federal Government to the cantonal authorities.

Since 1888 there has been no compulsory vaccination in most of the German cantons, and these cantons showed (from 1921–23) a small-pox incidence of 1910 per 1000, while the incidence in the French cantons was 24. Although the number of cases has increased so greatly the number of deaths, always less than 1 per cent., has dropped sometimes to less than 1 per 1000. Small-pox has lost its virulence; even among the non-vaccinated it is milder than it used to be among the vaccinated.

The American Medical Week in Paris.

Nearly 500 physicians and surgeons from the United States and Canada, many of them accompanied by their wives, are now visiting the hospitals and laboratories of Paris. The week was inaugurated in the great amphitheatre of the Faculty of Medicine, under the presidency of Mr. Herriot, President of the Chamber of Deputies, supported by Dr. Charles Mayo, of Rochester, and Mr. Peck, of Chicago. Among those present on the platform were the Minister of Public Instruction and of Hygiene, the Director of Higher Education, the Rector of the University of Paris, the Dean of the Faculty, and Mr. Tuffier, President of the organisation committee. Many congratulatory speeches were made. On leaving the building the members of the congress proceeded to the Arc de Triomphe to pay homage at the tomb of the unknown warrior. In the afternoon there was a reception at the Hôtel de Ville, when Mr. Guillaumin, President of the Municipal Council, conveyed a welcome from the City of Paris.

BERLIN.

(FROM OUR OWN CORRESPONDENT.)

Prof. Bier on Homœopathy.

Prof. Bier, the celebrated surgeon of Berlin, has caused a considerable sensation in medical circles by an article to the *Münchener Medicinische Wochenschrift*, in which he recommended the study of homœopathy. He said that the homœopathic doctrine had in some respects proved true; the treatment of inflammation by artificial congestion instead of the application of cold devised by himself and counter-irritation therapy were based on the theory of *similia similibus*. He had himself lately found that bronchitis caused by the administration of ether could be successfully treated by subcutaneous injections of ether; the application of hot air to a burn produced a rapid development of new epithelium. With regard to homœopathic dosage of certain substances, he had found from personal experience that one drop of iodine dissolved in a glass of water would abort the colds to which he himself was liable. In his hospital furunculi were treated with very small doses of sulphur, whereas it was known that large doses produced furunculi. Hahnemann's advice to ascertain the reaction of a healthy person to a certain remedy before deciding on the dosage in any disease he thought quite reasonable. Prof. Bier's manifesto was received enthusiastically by the medical and lay adherents of homœopathy. The homœopathic journals reproduced it with sensational headings such as "celebrated professor converted to homœopathy" or "Hahnemann's works recommended by University Professor," &c. Copies of the article were distributed in meetings of the homœopathic societies and the homœopaths renewed their old demand that chairs of homœopathy be instituted at the universities. The medical press, commenting on the whole affair, stated that by reopening a discussion which had apparently been closed many years ago Prof. Bier had done great damage, especially to the younger generation, whose therapeutical views were not quite settled. To combat that damage the *Münchener Medicinische Wochenschrift* published a reply to Prof. Bier by Prof. Henbuer, the well-known Professor of Pharmacology at Göttingen University; the *Deutsche Medizinische Wochenschrift* reprinted articles which had appeared in former issues by the late Prof. Harnack dealing with that question. The Berlin Society for Internal Medicine convoked a medical meeting in the Langenbeck-Virchow House, Prof. His being in the chair. The great assembly hall was crowded as never before, more than 1200 medical men and women being present. Strict control was carried out at the entrance to prevent laymen from entering, the daily papers having drawn the attention of the public to the meeting. Before the meeting Prof. Müller, of Marburg, gave a report of the history of homœopathy, Prof. Heubner, of Göttingen, spoke on the differences between the dogma of homœopathy and experimental natural science. In the discussion Prof. Bier said that medicine was more than a natural science; it ought to be regarded as an art where intuition is essential. Medicine had often been advanced by the intuition of men of genius, even if their views had not been in accordance with natural science. According to him, Hahnemann was such a genius, although his works must be regarded as a mixture of the highest wisdom and the greatest folly. He had expected to be severely attacked by his professional brethren. He was far from being converted to homœopathy, as had been suggested both in the press and in letters received by him, but he only wished to draw attention to the fact that there was some truth in homœopathy. It was useless to treat its adherents with contempt, rather should harmony be brought about between homœopathy and allopathy. With the exception of some homœopaths, all the speakers combated Prof. Bier's views. The meeting lasted about four hours and ended late in the night.

Lawsuits between Medical Men and Locum Tenents.

The great medical union known as the Hartmann-Bund, formerly Leipziger Verband, provides its members with locum tenents in cases of absence or illness, a work done in England by private medical agencies. Candidates to such posts had to subscribe a declaration that they would abstain for a couple of years from settling in the town or district of their employer. This declaration led in many instances eventually to lawsuits where it was not observed by the locum tenens, who settled down in his former employer's neighbourhood and did him grave damage. Law courts had given different verdicts in the matter, some stating that such declarations were not in accordance with the law, whilst others had found for the plaintiffs. By a recent judgment of the High Court of Justice the matter is now definitely settled. It is decided that the declaration must be regarded as illegal; as the medical profession is a scientific institution controlled and protected by the State for the welfare of the population, members of that profession cannot be denied the exercise of their calling through private agreements on merely economical grounds. This judgment is obviously not in accordance with the present economical condition of the profession. Doctors must have recourse to such private agreements in order to protect their economical interests, although they were blamed in so doing by the High Court. Medical men do not see the meaning of "State protection" in a country where anybody is allowed to give medical advice and charge fees for it without being medically qualified provided he does not make use of a recognised medical title.

Doctors' Income-tax.

In a recent leading article in THE LANCET, entitled "Penalising Medical Efficiency,"[1] it is stated that according to a decision of the High Court a county medical officer is not entitled to deduct the amount of his subscriptions to medical societies from his income-tax assessment. It may be of interest to English readers to learn what the law and the regulations are in Germany concerning the items to be deducted by a medical man. The German High Court has lately decided that every expense which served to keep a medical man abreast with new scientific research and to increase his knowledge in order to apply new

[1] THE LANCET, June 6th, p. 1191.

methods of treatment may be deducted. Those expenses include subscriptions to medical journals, membership of medical societies, travels to medical congresses, and post-graduate courses. A certain amount may be deducted annually for the amortisation of the cost of a medical library. According to a later decision the subscriptions, but curiously not the entrance fees, to professional societies having no scientific but only economical aims are deductible. Like other professional men a medical man is entitled to deduct from his net income that part of his house rent which covers the rooms used solely for the conduct of his practice—viz., the consulting and the waiting-room and the expenses for heating and lighting them, the depreciation of furniture, of instruments, and the telephone. If a servant is employed exclusively for the conduct of practice, the total salary may be deducted; if the servant does other housework also, a part of it only. The expenses entailed in keeping a carriage, a motor, or a bicycle together with the salary of the driver or chauffeur are also exempt, and it does not matter if the medical man uses those vehicles occasionally for non-professional purposes, it being supposed that he would not have bought them except as a help in his practice. During the time of the depreciation of the currency, when it was impossible to fix those expenses, medical men had to deduct 25 per cent. of their net income for "professional expenses."

Syphilis of the Stomach.

At a recent meeting of the Berlin Surgical Society Dr. Rumpel reported cases of gummata in the stomach lately operated on by him. He stated that such cases were very rare. Several forms of syphilitic affections of the stomach must be distinguished: (*a*) Gastritis with thickening of the wall of the stomach, caused by a proliferation of the submucosa; (*b*) gummata, multiple or single, which might become ulcerous and, like other ulcers, might lead to hæmorrhage and to perforation. The syphilitic ulcers, he said, had a smooth base covered with lardaceous matter. A reliable diagnosis was very difficult, but when symptoms of gastric ulcer were present without increase of gastric acid, syphilitic ulcer might be suggested. The administration of salvarsan was of no value for the diagnosis. In one instance the diagnosis had been made previous to the operation. Dr. Rumpel had operated upon two cases where, when the stomach had been opened a growth like cancer was found which on microscopical examination proved to be gumma. In the discussion Dr. Nordmann reported that he had operated upon three cases; a phlegmonous infiltration of the surroundings of the ulcers seemed to be characteristic. Two of his cases died, the other recovered, but afterwards died from aneurysm.

INFECTIOUS DISEASE IN ENGLAND AND WALES DURING THE WEEK ENDED JULY 4TH, 1925.

Notifications.—The following cases of infectious disease were notified during the week, namely:—Small-pox, 65; scarlet fever, 1563; diphtheria, 836; enteric fever, 42; pneumonia, 690; puerperal fever, 39; cerebro-spinal fever, 5; acute poliomyelitis, 6; encephalitis lethargica, 57; continued fever, 3; dysentery, 4; ophthalmia neonatorum, 119. There were no cases of cholera, plague, or typhus fever notified during the week.

Deaths.—In the aggregate of great towns, including London, there were 6 deaths from enteric fever, 54 from measles, 10 from scarlet fever, 65 from whooping-cough, 21 from diphtheria, and 30 from influenza. In London itself there were no deaths from influenza; deaths from whooping-cough numbered 12, and from diphtheria 5.

BOTANIC LABORATORY FOR BEDFORD COLLEGE.—The new Sargant Laboratory of Plant Physiology at Bedford College for Women, the only one of its kind in London, was opened on July 9th by Lord Justice Sargant. The money for the laboratory was bequeathed by his sister, the late Miss Alice Sargant, who was formerly a student and ardent admirer of Bedford College. The laboratory has a botanic garden attached to it.

Correspondence.

"Audi alteram partem."

THE RIVER AMAZON FOR TOURISTS.

To the Editor of THE LANCET.

SIR,—In the last few years the attractions of the Amazon have begun to interest a considerable number of tourists, and to those who have never visited this section of Brazil the trip from Pará to Manáos cannot fail to be of interest.

It has come to my notice that some British practitioners, on being consulted by their patients as to the advisability of making this trip, give warnings of the Amazon being a region of yellow fever, malaria, and swamps. In all justice to the Federal and State authorities such statements should be contradicted. Yellow fever became extinct in Pará after the anti-yellow fever campaign of Oswaldo Cruz in 1911, and the State of Amazonas has been recorded clean since the end of 1913.

When I arrived in Manáos in 1905 the situation was vastly different; then it was the case that most of the newly-arrived foreigners sooner or later suffered from "yellow jack"—I was an early victim—and malaria was rife all over the town. To-day all is changed and the tourist no longer excites the wonder of the Manauense, nor is the commercial traveller considered to be a brave man for venturing so far up the Amazon. It is a difficult matter, however, to eradicate the old idea of the Amazon being a death's hole; but the health of the foreigner is excellent, and I have only a couple of cases of malaria a year to deal with. Malarial fevers are common, certainly, but they are contracted in regions which the tourists never visit.

Manáos is only about 3·40 metres above sea-level and lies in lat. 3° 08′ 30″, and long. 59° 59′ 27″ west of Greenwich. The temperature, while not high for the tropics, is very constant and ranges between 75° and 95° F. in the hot season and 68° and 86° F. in the cooler months; the relative humidity is 63 per cent. to 79 per cent. The temperature in Pará is rather lower and there is more breeze. Both cities were provided with all modern advantages when the "black gold" of the Amazon (rubber) commanded high prices and favourable exchange, and, consequently, the drainage and water systems are good; there are excellent tramways and all the comforts of electric lighting and ventilating. Pará possesses a modern and cool hotel.

It is a matter of regret that more medical men do not visit this country of Wallace, Bates, and Spruce, for it is full of interest. I believe Sir John Bland-Sutton enjoyed his visit, although he did far more sightseeing and observing than the ordinary tourist. I think it would be wise to advise patients to wear clothing suitable for the warmer climate of the tropics—sun helmets are not required—and to keep to a hot weather dietary. This advice is necessary when they leave Pará for the trip up the Amazon to Manáos and encounter a greater humidity as well as leading a sedentary life for the four days on board ship until they arrive at Manáos and can step ashore at a miniature Liverpool landing stage for exercise and sightseeing. I do not recommend pulmonary tuberculosis cases making the tour, and patients with very high blood pressure should be warned not to exert themselves unduly during the hotter part of the early afternoon.

I am, Sir, yours faithfully,

H. WOLFERSTAN THOMAS,
Manáos Research Laboratory, Liverpool School of Tropical Medicine.

June 8th, 1925.

*** We may remind intending tourists of the promising field offered by the Amazon Valley for finding new drugs, *videlicet* annotation in our issue for July 4th.—ED. L.

THE PURSUIT OF PURE MILK.

To the Editor of THE LANCET.

SIR,—No one who has any knowledge of the conditions under which milk is produced, distributed, and consumed in this country can dispute the general conclusions of your article on "The Pursuit of Pure Milk." May I be allowed, however, as chief chemist and bacteriologist of the distributing firm responsible for the large portion of London's milk-supply, to controvert a suggestion contained in your remarks on pasteurisation, which may prove misleading. "The basal fact," says your article, "is that at the present time the bulk of the milk consumed in the large towns is pasteurised by processes which are uncontrolled as regards the temperatures reached or the time the milk is held at a high temperature." The implication here and in succeeding sentences is that pasteurisation is a purely casual process of heating, and the phrase "controlled pasteurisation," a few lines lower down in the article, is used seemingly as a synonym for "scientific pasteurisation," as distinct from the commercial significance of the term.

I should like to state categorically that the suggestion, so far as concerns the plants controlled by the United Dairies, Ltd., is entirely unjustified. The milk distributed by the firm's associated companies is pasteurised under a system of control which ensures its being submitted to an even temperature of 145° F. for half an hour. In their plants the holding tanks are provided with an automatic temperature recorder, which affords incontestable proof of the constancy of the heat to which the milk is subjected. An automatic device provides for the release of the milk from the tank at the end of half an hour.

Moreover, our inspectors conduct frequent examinations of the plants to ensure the cleanliness of the apparatus, and samples are taken at every stage of the process.

Milk can be made clean and safe by means of filtration, clarification, and pasteurisation, but milk producers in this or any other country have not yet reached that state of idealistic perfection when clean production will obviate the necessity for these dairy processes.

Until we reach this Utopian state of affairs, pasteurisation is the only method of maintaining a milk-supply which can be truthfully described as "safe." In fact, in such advanced dairying countries as Denmark, Sweden, and many of the United States of America, pasteurisation is compulsory.

It may remain questionable whether in the process of pasteurisation something is lost of the nutritive qualities of the milk, though my own researches have led me to the conclusion that the loss is negligible. What is beyond question is that safety—i.e., freedom from pathogenic organisms—must be our first consideration. In this connexion, with the coöperation of Prof. R. T. Hewlett, of London University, who is consulting bacteriologist to United Dairies, Ltd., I have conducted a series of tests over a period of many months with the most encouraging results. In every case where milk samples (taken from herds in all parts of the country and not from cows especially inoculated for our purposes) have been found tuberculous before pasteurisation, no trace of infection remained after the process.

United Dairies are doing their utmost in all ways to encourage healthy herds and clean production on the farms, but, of necessity, the bulk of this important work must fall to the Ministries of Agriculture and Health.

I may add that Prof. Hewlett desires me to say that he associates himself with all I have said in this letter.

I am, Sir, yours faithfully,

J. D. ROBERTS.

Analytical and Bacteriological Laboratories,
35, Little Russell-street, London, W.C.,
July 7th, 1925.

*** Our remarks referred to milk consumed in the large towns, not specifically to London, and we have yet to learn that the holder system of pasteurisation is applied throughout the country. The essential point is that, apart from control by Government regulation, it is open to anyone who supplies milk to alter the temperature to be employed or the length of time during which it is maintained, or to use or not to use a holder type of pasteuriser. The milk is not sold as "pasteurised" milk and therefore is not subject to inspection by the Ministry or the local authority. Such pasteurisation can properly be spoken of as uncontrolled. The effect of pasteurisation in retarding efforts to obtain a clean milk-supply is adequately dealt with by Dr. Savage in his special article.—ED. L.

THE ATTRACTIONS OF THE ROYAL NAVAL VOLUNTEER RESERVE.

To the Editor of THE LANCET.

SIR,—May I ask your assistance in calling the attention of the younger members of the medical profession to the attractions offered by service in the Royal Naval Volunteer Reserve?

The R.N.V.R. consists of seven divisions: London, Scottish, Tyne, Mersey, Bristol, Sussex, and Ulster. The establishment provides for 205 medical officers; of whom 50 are on List I. and the remainder on List II., and in addition 28 dental surgeons. Each category has to serve 28 days at sea during their first year of service and subsequently 14 days biennially either afloat in one of H.M. ships or in a naval hospital or depôt. Those on List I. have in addition to attend periodically at the headquarters of the division to which they are attached for the examination of recruits and other medical duties. The age of entry is from 21 to 32 years. Provision is also made for the entry as surgeon sub-lieutenants of students from 19 to 26 years who have passed their intermediate examination in anatomy and physiology. Promotion is on the same basis as in the Royal Navy except that no examinations are held. During training medical officers receive the naval pay of their rank, and £50 is provided for the expenses of uniform on joining, or, in the case of probationary officers, on confirmation in rank.

The service affords a unique opportunity for seeing the life of the Royal Navy, as well as providing every two years a most interesting experience free of all expense and well paid for the duties required, whether afloat or ashore. Applications for commissions should be addressed to the commanding officer at the headquarters of the nearest division, from whom full particulars can be obtained.

I am, Sir, yours faithfully,

J. BRUCE RONALDSON,
Surgeon-Commander, R.N.V.R.

H.M.S. *President*, Victoria Embankment, E.C. 4,
July 13th, 1925.

PRELIMINARY TRAINING IN DOMESTIC ARTS, KING'S COLLEGE HOSPITAL.

To the Editor of THE LANCET.

SIR,—Twelve months ago THE LANCET kindly expressed an interest in the establishment of a course of domestic arts in connexion with the preliminary training school which was opened at the beginning of September. Perhaps you will allow me to report upon the points upon which some doubt was expressed. It has been proved quite clearly that the two sets of pupils have been, in the American phrase, which you quoted, "good mixers." Those who have taken the course without any idea of becoming nurses have taken a keen interest in the scientific, practical, and domestic sides of the course, and their influence has been distinctly helpful.

The suggestion that the pupils would be taking the place of paid domestic help in the pupil nurses' home is one which is not supported in fact. All pupils, whether nurse pupils or not, have certain duties to

perform under supervision as part of their training; that is part of the curriculum and without it the course could hardly be said to fulfil its function. Paid domestic help is made use of for those parts of the work which it is neither desirable nor helpful for the pupils to carry out, and the amount and expense of such assistance employed are increased by every additional pupil, whether she be in training for the nursing school or not.

THE LANCET made a somewhat cruel insinuation against the girl of the present day in suggesting that the opportunity to appreciate some of the joy of service would have no attraction for her. The opportunity to see something of the work of the hospital and the privilege, which also THE LANCET doubted, of taking some part in its work, have, in fact, been greatly appreciated by the pupils, and have, it is believed, exerted a beneficial influence on those who have undertaken the course.

I am, Sir, yours faithfully,

C. E. A. BEDWELL,
House Governor.

July 13th, 1925.

*** We are happy to publish Mr. Bedwell's letter. The annotation will be found in THE LANCET of 1924, ii., 504, under the title "Housewifery in a Hospital Milieu" and Mr. Bedwell does not reproduce the words we used.—ED. L.

Obituary.

ALEXANDER JOSEPH McAULEY BLAYNEY, F.R.C.S.IREL.,

SURGEON TO THE MATER MISERICORDIÆ HOSPITAL, DUBLIN.

THE tragically sudden death of Mr. Alexander Blayney on Sunday last, July 12th, has caused deep grief in the medical profession of Dublin and Ireland. He had recently had an attack of influenza, and while walking with his wife and children across the Portmarnock golf links, he suddenly fell to the ground. Medical aid was to hand at once, but death had apparently been instantaneous. He was 56 years of age.

Alexander Blayney was born in Co. Antrim and educated in Belfast and in the Catholic University, Dublin. He had a distinguished career in the Royal University, winning, among other honours, the studentship in biology. He took his medical degrees in 1893, and became a Fellow of the Royal College of Surgeons in Ireland in 1898. He held for a time the chair of Biology in University College, Dublin, but his bent was toward surgery, and early in his career he became one of the surgical staff of the Mater Misericordiæ Hospital. Since the foundation of the National University in 1908 he was assistant to the professor of surgery in the Dublin College. He was a Member of Council of the Royal College of Surgeons in Ireland for many years past and could easily have reached higher honours in the College had he sought them. He held, from time to time, examinerships both in the Royal College of Surgeons and in Trinity College, Dublin. During the war he served in the 83rd (Dublin) General Hospital, with the rank of major.

For many years past Mr. Blayney had one of the largest operating and consulting practices in Ireland. He had a wide and accurate knowledge of his subject, and was endowed with a judicious mind and even temper, with the result that his diagnosis was careful and sound, and very rarely was he led into error. In operation he was cool and resourceful. Any practitioner who once sought his help in a difficult case rarely thought of looking for another surgeon ever after. Though his ability as a surgeon was recognised by both the profession and the public, Mr. Blayney never took the prominent position in the profession to which his talents entitled him. He sought retirement and avoided publicity. He never sought the chair of his College in spite of the pressure of his friends, but it was understood that he would in the near future have allowed his name to go forward. Apart from his profession he was a man of wide reading and much culture, loving literature, music, golf, bridge, and conversation. Reserved with strangers, and always modest and retiring, something more than a casual acquaintance was required to discover the fund of humanity, humour, and wisdom that lay behind his quiet manner. His death was so sudden and unexpected that in the sense of the loss of a loved friend his colleagues cannot yet realise how much Irish surgery has suffered.

JOSEPH BOWER SIDDALL, M.D. ABERD.

Dr. Joseph Bower Siddall, who died at Great Malvern on July 4th, at the age of 85, was in the real sense of the word a pioneer of medicine, for in 1868 he went to Japan as medical officer to H.B.M.'s Legation. There, in association with the late Dr. Willis, he had charge of the Japanese hospitals in Yokohama, and later in Yedo (now Tokio) during the War of the Restorature in 1868–69. He established the first hospital, called the Dai Biyoin (or the Great Hospital) in Yedo in 1868, where he accomplished his cherished aim of introducing hygienic methods into the Japanese military service. He put his experience on record in an article published in Vol. V. of St. Thomas's Hospital Reports. He so forcibly advocated the value of vaccination in Japan that the Mikado issued an order that the whole of the population was to be vaccinated, with the result that in 15 years small-pox was virtually stamped out. Previously no measures had been adopted to combat this disease, which was very rife. For his services to Japan he was awarded the Order of the Rising Sun by the Mikado, but it was not until 1909 that he received the permission of the British Foreign Office to wear the Order. He had the distinction of being the first foreigner to receive it. Dr. Siddall was a fine cricketer in his day, and his golf-handicap was four. He played cricket for the Gentlemen of England, and as he stood 6 ft. 2 in., and was broad in proportion, he was naturally a hard hitter. He was proud of the fact that he had smashed the clock at the Oval; he occasionally played in the same eleven as the "Three Graces." At the Royal North Devon Golf Club, of which he was one of the founders, he used to tell how Mr. J. H. Taylor as a boy acted as his caddy. Dr. Siddall qualified from St. Thomas's Hospital in 1864 as M.R.C.S. Eng. and L.S.A. He afterwards went to Aberdeen, where he took the M.D. with highest honours.

On his return from Japan he practised for a time at Ross-on-Wye, retiring about 35 years ago to reside in Devonshire and latterly in Malvern. Dr. Siddall married Mary Elizabeth, second daughter of Charles Binns, J.P., of Claycross Hall, Chesterfield, who predeceased him some years ago.

HAROLD CLIFFORD, M.B. LOND., F.R.C.S. EDIN.

Dr. Clifford, whose death took place at his residence, St. John-street, Manchester, on July 8th, was well known as a gynæcologist. Son of the late Dr. John Clifford, the veteran Baptist preacher, Dr. Clifford settled in Manchester 25 years ago after taking a medical course at University College, London, where he was house physician at the hospital. Qualifying in 1897, he took the M.B. Lond. in 1899 and the F.R.C.S. Edin. in 1905. He was connected with the staff of St. Mary's Hospital for many years, and since 1913 was honorary surgeon and gynæcologist at the Royal Salford Hospital. He lectured on clinical obstetrics at the Victoria University of Manchester, and was an external examiner in midwifery at Queen's University, Belfast. Dr. Clifford had been in indifferent health for some months, but his death was sudden and took his many friends by surprise.

Parliamentary Intelligence.

HOUSE OF LORDS.

THURSDAY, JULY 9TH.

Mental Deficiency Bill.

THE Mental Deficiency Bill was read a second time. This Bill has already passed through the House of Commons.

HOUSE OF COMMONS.

WEDNESDAY, JULY 8TH.

Vaccination and Chicken-pox.

Mr. BROMFIELD asked the Minister of Health whether, in view of the difficulties which existed in regard to the diagnosis of mild small-pox and chicken-pox, he would give instructions, in cases where chicken-pox was made a notifiable disease, for the condition of the patients as regards vaccination to be stated on the form of notification, with a view to statistical records being inserted in the annual reports of the medical officers of health showing the total number of vaccinated and unvaccinated chicken-pox cases notified in each year.—Sir KINGSLEY WOOD (Parliamentary Secretary to the Ministry of Health) replied: The answer is in the negative. My right hon. friend is advised that a mere statement on the notification form as to the vaccinal condition of such patients would not be of any material assistance in arriving at an accurate diagnosis, and as it has never been suggested that vaccination affords any protection against chicken-pox, he does not consider that statistical records as to the vaccinal condition of patients suffering from that disease would be of value.

THURSDAY, JULY 9TH.

Provision of Massage for Disabled Men.

Captain BOWYER asked the Minister of Pensions whether in future he would utilise the services locally in rural areas of qualified masseurs and masseuses for the treatment of disabled men, and thus save the time of the men and unnecessary suffering to the disabled.—Major TRYON replied: It is the experience of the Ministry that massage is most effectively administered in the interests of patients when carried on at a clinic under proper medical supervision. Where, however, this treatment can be efficiently administered otherwise, and attendance at a clinic would involve serious inconvenience and hardship to the patient, alternative arrangements are allowed.

Distribution of Health Insurance Surpluses.

Sir HENRY CAUTLEY asked the Minister of Health under what authority and for what reason he prohibited approved societies from distributing the surpluses, over and above the requisite reserves, disclosed by the recent valuations in extra cash benefits in excess of 5*s.* for sickness benefit; and whether, considering the difficulty in devising schemes for other benefits in the case of the small societies such as those in the Sussex County Association, he would allow all the surpluses, except requisite reserves, to be distributed in extra cash benefits.—Mr. NEVILLE CHAMBERLAIN replied: In accordance with a decision of the National Health Insurance Joint Committee, approved societies have been recommended in the interests of their members not to adopt extra cash benefits in excess of 5*s.* a week for sickness benefit unless they are also making reasonably adequate provision for treatment benefits. Schemes complying with the latter condition, and providing for an increase of over 5*s.* in sickness benefit, have already been sanctioned for several societies, including three that are constituent societies of the Sussex County Association. It will be seen, therefore, that there has not been a general prohibition of the kind suggested in the question.

Extension of Health Insurance Membership.

Mr. DENNISON asked the Minister of Health the number of insured persons who were unable to claim the extension of National Health Insurance membership under The Prolongation of Insurance Act, 1921, owing to the fact that they had not paid the necessary contributions in the two contribution years ending July, 1920, or in any other respects had not complied with the statutory conditions of the Act; and if such persons would be disqualified from claiming the benefits in accordance with the provisions of the Widows', Orphans', and Old Age Contributory Pensions Bill.—Mr. NEVILLE CHAMBERLAIN replied: Cessation of insurance, otherwise than by death, may be due to a variety of causes, and particulars are not available at headquarters to show, with regard to the members of between 8000 and 9000 approved societies and registered branches, how far cessation may have been due to a particular cause such as that to which the hon. Member refers. With regard to the second part of the question, it will not be possible under the Widows', Orphans', and Old Age Contributory Pensions Bill for a claim to benefits in respect of his own insurance to be made by a person who is out of insurance at the time of the claim.

Pollution of the River Lee.

Captain GARRO-JONES asked the Minister of Health how long he anticipated it would be before the measure he contemplated for improving the condition of the River Lee would take effect; whether these measures, when completed, would entirely remove the nuisance of crude sewage; and whether, in order to relieve the anxiety of those to whom this nuisance caused risk to health, he could undertake to press forward the measure with the utmost expedition.—Mr. NEVILLE CHAMBERLAIN replied: The two places which most affect the state of the river at Hackney are Enfield and Edmonton. The new works at the former are expected to come into operation in a few weeks. The first instalment of the new measures at the latter place should come into operation in about six months time; I am informed that the work is being pushed forward. I am advised that when these works and those at Walthamstow and Leyton come into full effect, the present state of the river should be remedied.

Deaths from Measles.

Mr. FORREST asked the Minister of Health the total number of cases of measles for the last half-year and the total of deaths resulting therefrom; and whether his department could express any reason for the prevalence of this malady in the British Isles.—Mr. NEVILLE CHAMBERLAIN replied: Measles is not generally notifiable in England and Wales and I am, therefore, unable to give the total number of cases of this disease which occurred during the last half-year. The number of deaths from measles in England and Wales during the first quarter of the present year was 1626, but this is a provisional figure and the number of deaths during the second quarter is not yet available. I am advised that no specific reason can be given for the prevalence of this disease, but that there is no evidence of exceptional incidence in the country as a whole.

Administration of Maternity Benefit.

Colonel ENGLAND asked the Minister of Health whether his attention had been called to the statement of the late principal medical officer of the Ministry of Health attacking the administration of the maternity benefit by the approved societies; and whether the preference expressed for its administration by local public health authorities was entertained by his present advisers.—Mr. NEVILLE CHAMBERLAIN replied: The statement to which I assume that my hon. friend refers was made, not by a late officer of the Ministry of Health, but by the former medical officer of the Local Government Board. The matter in question is within the purview of the Royal Commission on National Health Insurance, and I propose to await their report before expressing any opinion upon it.

High Mortality in Market Drayton.

Mr. GRIFFITHS asked the Minister of Health whether he had received a reply from the Shropshire county council with regard to certain suggestions arising out of the report of his inspector as to the high mortality of Market Drayton, which was communicated to that council; and, if so, whether he would now publish the report, in order to assist in a movement to save the infants in the district in question.—Mr. NEVILLE CHAMBERLAIN replied: The answer to the first part of the question is in the affirmative. As regards the second part, I would refer the hon. Member to the answer which I gave on July 2nd.

The Spahlinger Treatment of Tuberculosis.

Mr. CHARLES EDWARDS asked the Minister of Health whether he had seen the report of the medical men who were Members of this House who had been investigating the Spahlinger treatment and its effects; and whether, seeing that it was so favourable to that treatment, he would take steps to ensure that it should be made available for sufferers in this country.—Mr. NEVILLE CHAMBERLAIN replied: I have not yet seen this report, but I understand that the conclusion reached is that a *prima facie* case has been made out for the Spahlinger treatment, and that the report recommends that an exhaustive trial of the remedy should be made. As regards the second part of the question, I may point out that I have repeatedly stated that I am anxious to arrange for a scientific investigation of this method of treatment in this country as soon as the materials are made available. I have been waiting for three years for these materials, but I am still without information as to when they are likely to be forthcoming, and I understand that the report referred to contains no assurance that the treatment is or can soon be available in this country. Some weeks ago, however, I arranged for two of the medical officers of my department to pay a further visit to Geneva for the purpose of conferring with Mr. Spahlinger on this and other questions.

MONDAY, JULY 13TH.

Tubercle Bacilli in Milk.

Mr. VERNON DAVIES asked the Minister of Health if he had received a copy of the resolution passed at the eleventh annual conference of the National Association for the Prevention of Tuberculosis to the effect that a considerable proportion of tuberculosis in childhood is due to infection through the presence of tubercle bacilli in milk offered for human food, and urging His Majesty's Government to render effective the provisions of the Milk and Dairies Act; and whether he was prepared to act upon this suggestion.—Sir KINGSLEY WOOD replied: My right hon. friend has seen the resolution referred to. The Milk and Dairies Act of 1915, which deals with this subject, will be brought into operation on Sept. 1st next.

Unregistered Midwives.

Mr. BENNETT asked the Minister of Health whether representations had been made to him, and if so, by whom, in favour of the elimination of unregistered practising midwives; and whether, in that case, he could state the views of the department on the matter and the likelihood of obtaining an adequate number of registered midwives.—Mr. NEVILLE CHAMBERLAIN replied: Yes, Sir, I have received many such representations from local supervising authorities and other bodies. I am in favour of the elimination of unregistered midwives, and I do not anticipate difficulty in obtaining an adequate number of registered midwives. I have it in mind to deal with the matter in a Bill to amend the Midwives Act which I propose to introduce as soon as other commitments allow.

TUESDAY, JULY 14TH.

Midwives for Insured Persons.

Colonel DAY asked the Minister of Health whether he was prepared to provide contributions from the funds available under the National Health Insurance Act towards district nursing associations employing qualified midwives to attend insured persons, in view of the importance of these associations among health services.—Mr. NEVILLE CHAMBERLAIN replied: An approved society is entitled to devote part of its disposable surplus on valuation to making payments towards the cost of providing nursing for its members, and may also make subscriptions or donations from its benefit fund for the support of district nurses. There is not, however, any provision in the National Health Insurance Act for the making of payments for the specific purpose of securing the attendance of midwives on insured women at confinement, and before considering the desirability of amending legislation in this direction I must await the report of the Royal Commission on National Health Insurance.

Sale of Tainted Food.

Colonel DAY asked the Minister of Health whether he was aware that recently in the borough of Lambeth it was found that a local meat retailer boiled pork and beef in a portable copper situated in a yard full of flies and other insects attracted by neighbouring dustbins, and that the medical officer of health traced 24 cases of food poisoning to this tainted source; and would he consider introducing legislation to give local authorities increased power in order to deal with such practices which were dangerous to public health.—Sir KINGSLEY WOOD replied: My right hon. friend has received a copy of the report of the medical officer of health on the case to which the hon. and gallant Member refers. He is considering what steps may be practicable and desirable with a view to regulating the conditions under which food is prepared.

IRISH FREE STATE: MEDICAL MEN AS CANDIDATES FOR THE SENATE.—Our Dublin correspondent writes: The names of a few medical men are included in the panel of candidates from whom 19 vacancies in the Senate are to be filled in September. Among them are Mr. H. L. Barniville, F.R.C.S.I., an outgoing senator who seeks re-election; Sir Arthur Chance, a past President of the Royal College of Surgeons in Ireland; Mr. Denis Kennedy, F.R.C.S.I.; Mr. P. McCarten, F.R.C.S.I., formerly a member of the Dail; and Dr. Anthony McBride, of Castlebar.

NORTH PERSIAN FORCES MEMORIAL MEDAL.—Captain W. H. Dye, R.A.M.C., has been awarded this medal for the year 1924 for his paper Schistosomiasis and Splenomegaly in Central Africa, published in the *Journal of the R.A.M.C.* of September, 1924. At the time this work was done Captain Dye was seconded from the Royal Army Medical Corps and was doing duty under the Colonial Office in Nyasaland. This is the second award of a medal to be given annually for the best paper (reaching a certain standard) on tropical medicine or hygiene published during the preceding 12 months by any medical officer in the Services of under 12 years' seniority.

Medical News.

UNIVERSITY OF DURHAM.—At Convocations held on June 30th and July 1st the following medical degrees were conferred:—

Doctor of Medicine.—John F. C. Braine, Jabez E. Dainty, Thomas Ruddock-West, Eleanor H. Russell, Harold Williamson (*in absentia*), George Hurrell, Mona Kirkhouse and Eric H. Shaw.

Doctor of Medicine for Practitioners of 15 Years' Standing.—James Ross, Albert Turner, Henry S. Brown, and Philip T. Harper.

Bachelor of Medicine and Bachelor of Surgery.—Drummond R. F. Bertram, Frank H. Blackburn, Nora E. Coltman, Eric V. Griffiths, John T. Holliday, Marjory G. T. Jacka, Ethel G. Potts, Francis E. Stabler, Stuart C. Stonier, Reginald Wear, Charles W. Arnot, Abraham Brodie, John Brown, Alfred Charlton, John R. Garson, Austen H. Holmes, Sinclair Hughson, Hirsch Levy, James D. W. McCracken, Donald W. MacLaren, William C. Pinkney, Arthur de Redder, Walter Toward, and Charles C. Ungley.

The following received the Diploma in Public Health (D.P.H.):—

Siegfried Annecke and Harold C. Simpson.

The following received the Licence in Dental Surgery (L.D.S.):—

Thomas E. Coulson, Wilfred A. Gale, Donald Gibson, Elsie L. Peet, and Norman Wilkinson.

At the Third Examination for the degrees of Bachelor of Medicine and Bachelor of Surgery the undermentioned candidates satisfied the examiners in the following subjects:—

Materia Medica, Pharmacology, and Pharmacy; Public Health; Medical Jurisprudence; Pathology and Elementary Bacteriology.—Oswald C. Dobson and William Irving (with second-class honours), Ronald E. Alderson, Max Davison, Joseph Furman, William R. S. Good, David Gamsu, Rebecca Harbit, Douglas E. Hearn, William B. Hicks, Gerald Holmes, Dennis S. Jackson, Thomas F. Jarman, Maurice Levi, Cyril Mason, Gilbert McLaren, George N. Myers, Harry P. Nelson, Leslie D. Nelson, Eleanor Patterson, Hugh C. S. Pimblett, Edward Porteus, Victor B. Purvis, Cyril F. Richardson, Francis H. Robson, Gibson Salisbury, and Stanley W. Smith.

UNIVERSITY OF LIVERPOOL.—At examinations held recently the following candidates were successful in the undermentioned subjects:—

DEGREE OF M.D.

S. B. Herd, Elizabeth Hunt, G. W. Phillips, and D. Riding.

DEGREES OF M.B. AND CH.B. (HONOURS).

Class I.—*†Gwyneth Griffith and †‡G. McNichol.

Class II.—‡L. J. A. Loewenthal, ‡J. C. Ross, and *C. E. Unsworth.

* Distinction in Surgery. † Distinction in Obstetrics. ‡ Distinction in Medicine.

FINAL EXAMINATION FOR DEGREES OF M.B. AND CH.B.

Part III.—C. P. Allen, A. T. Ashcroft, H. M. Boston, C. L. Copeland, N. L. Corkill, J. L. Donnelly, L. Earlam, Sybil O. Edwards, W. Emdin, M. Fisher, C. J. S. Garton, M. Goldberg, I. Gordon, J. Graham, Frances M. Greenhalgh, Dorothy M. Hanson, C. A. Harris, Beryl M. Hawthorn, J. C. Heal, F. C. S. Hinsbeeck, R. E. Horsfall, S. Howard, J. E. Howie, E. Hughes, F. Hughes, F. P. Irvine, Elvy I. Johnstone, R. C. Jones, D. Katz, S. M. Katz, B. Krikler, J. E. S. Lloyd, W. J. Lloyd, T. R. E. Longton, H. McGrath, Isabel McKee, D. J. T. Magowan, K. N. Mawson, E. Miles, D. H. Mills, E. L. Murphy, Irene M. Neal, Winifred A. Nicholson, J. R. Oddy, H. Peaston, J. W. Reid, Miriam Roskin, Margaret E. Thomas, J. J. du Toit, J. Unsworth, Rosalind Vacher, B. J. van de S. de Villiers, and F. W. Yates.

Part II.—J. H. Boultbee, *J. L. Clegg, G. S. Clouston, K. McL. *Cobban, K. Edmundson, R. W. Eldridge, A. B. Follows, J. F. Galloway, Elinor M. Gelling, *E. E. Glenton, L. S. Goldman, *I. Gurland, Elizabeth M. Harding, D. G. Henry, Mary Hope-Simpson, *H. E. Hughes-Davies, E. Hulme, B. S. Jarvis, T. A. Jermy, A. N. Jones, *J. S. Logan, M. A. Lombard, D. B. Macaulay, J. C. McFarland, G. McLoughlin, S. G. Massey-Lynch, A. D. Polonsky, D. E. Pritchard, Muriel S. Roberts, A. V. Russell, N. R. Sheridan, Alfreda H. Slater, †G. D. Thompson, D. P. de Villiers, J. E. Wallace, R. G. Walmsley, †Kathleen M. Ward, A. K. Wilson, and Nora M. Wilson.

* With distinction in Public Health. † With distinction in Forensic Medicine and Toxicology.

Part I.—W. G. Brookes, K. M. Cobban, N. J. Crawford, W. A. Davies, W. E. Hargreaves, S. P. Meadows (distinction in Pathology), J. N. Parrington, Ivy H. Rowlands, N. P. Slade, E. S. Smith, and G. D. Thompson.

DEGREE OF M.H.

First (Part I.) Examination.—B. L. Davis.

DIPLOMA IN PUBLIC HEALTH.

J. G. L. Jones, Dorothy G. E. Potter, Frances Weightman, and D. A. Woodeson.

UNIVERSITY OF MANCHESTER.—The Council of the University and the board of management of the Manchester Royal Infirmary have instituted a new laboratory for clinical investigations. The laboratory, which is located in the Royal Infirmary, will be placed in charge of a Director, who will have the status of a lecturer in the University. Mr. W. M. Roberts, M.Sc., M.B., Ch.B. Manch., who has been appointed as Director, at present holds the position of assistant lecturer in chemical pathology. The following appointments have been made: Lecturer in Anatomy: Mr. David Stewart. Lecturer in Applied Anatomy: Mr. R. S. Paterson. Lecturer in Systematic Medicine: Dr. T. H. Oliver. Lecturer in medicine for Dental Students: Dr. C. H. Melland. The following awards have been made: Gold Medal for M.D. Thesis: W. M. Roberts; commendation for M.D. Thesis: A. M. Jones, Donald Ramage, and J. G. Woolham. Harling Fellowship: J. West; Prof. Tom Jones Memorial Surgical Fellowship: Leslie Morris; Platt Physiological Scholarship: W. H. Newton; Tom Jones Exhibition in Anatomy: F. N. Marshall.

At examinations held recently the following candidates were successful in the subjects indicated:—

FINAL M.B. AND CH.B. EXAMINATION.

•F. H. Smirk (first-class honours), N. W. Bolton and G. H. H. Booth (second-class honours), A. R. Addey-Redfern, Solomon Bernstein, Lilian Bond, Geoffrey Coope, T. A. Danby, A. A. Davis, †N. E. Delaney, †Kathleen Dickinson, Madge E. Edwards, Mary Evans, C. R. Fielding, Miriam Florentin, E. A. Gerrard, Mary Harburn, James Haslam, †May Johnson, Walter Johnson, Barbara M. Knight, G. F. Langford, G. H. March, C. T. Marshall, E. A. Marson, Ethel Morris, William Mottershead, †S. L. Mucklow, Archer Pearson, Henry Penman, †Joan Robinson, T. W. Rothwell, M. R. Sagar, N. F. Seed, W. H. Shepley, Joseph Shlosberg, Lois Stent, Jane B. Stubbs, Samuel Whalley, K. K. Wood, P. B. Wood, Reginald Wood, N. A. J. Young.

• Distinction in Medicine. † Distinction in Forensic Medicine.

Forensic Medicine and Hygiene and Preventive Medicine.—C. H. Bamford, Frances H. Bowden, John Crook, L. F. Evans (distinction in Forensic Medicine), Agnes G. Smiley, and J. C. Wilson.

Medicine.—Frances H. Bowden.

Hygiene and Preventive Medicine.—H. H. Bullough, I. H. Freedlander, R. M. Pearce, and A. D. Shubsachs.

Obstetrics and Surgery.—Louise Aronovich, Marion L. Bainbridge, A. R. Barber, J. R. Beal, Peter Bester, R. H. Blackburn, Florence M. Blades, Agnes Bodoano, Lillie M. Burton, S. J. Firth, T. S. Hanlin, F. S. Hawkins, Barnett Hirsh, ‡R. L. Holt, John Hunt, T. J. Kay, H. B. Kilroe, W. D. Mitton, R. J. Owen, Raphael Shaffer, W. S. Slater, Graham Stenhouse, Olive de la W. Turner, and E. J. Warburton.

Obstetrics.—‡H. K. Ashworth, Zaky Hanna, and Harry Pigott.

‡ Distinction in Obstetrics.

THIRD M.B. AND CH.B. EXAMINATION.

Pathology.—R. S. Abraham, Doris Bernard, J. W. Brooks, Louie J. Burton, Margaret Egan, Arthur Hancock, Ernest Heard, G. L. Normington, I. M. Preston, Nora Ridehalgh, C. D. Roff, R. F. Sheppard, and Donald Starr.

Pharmacology.—S. K. Appleton, Dorothy Arning, Harold Arstall, A. H. Baker, Dorothy M. Bradley, H. J. Brennan, Agnes N. Buckley, M. A. Chamberlain, E. B. Davies, Ralph Edmondson, Muriel M. Edwards, Amy H. Herbert, I. M. Hughes, J. H. Jones, Morris Levine, J. A. Longworth, Jean M. Marshall, H. E. Martin, J. S. Miller, Robert Newton (with distinction), Stanley Nowell, R. P. Osborne, G. H. Racklyeft, Norah Regan, Marshall Robinon, S. L. Rowley, Eleanor H. Schill, Lucy Stokoe, Alfred Thomas, F. F. Waddy, and Josephine Walmsley.

DEGREE OF CH.M.

J. A. Panton.

DIPLOMA IN BACTERIOLOGY.

Marion H. Black and G. E. Shaw.

DIPLOMA IN PSYCHOLOGICAL MEDICINE.

W. G. Thomson and C. B. V. Walker.

UNIVERSITY OF BRISTOL.—At examinations recently held the following candidates were successful:—

FINAL EXAMINATION FOR DEGREES OF M.B., CH.B.

Part I. (including Forensic Medicine and Toxicology).—Helen M. Aldwinckle, Cecily France-Hayhurst, Frederic W. T. Hughes, Ernest May, Richard E. Satchwell, and Stanley P. Taylor.

Part II. (completing examination).—David H. Beatson, Harry W. Brassington, Bessie V. F. Dawkins, Charles H. Durnford, William S. Ormiston, Maurice E. J. Packer, Yolande de la Pasture, Cecil P. Porter, and Thomas W. Ware.

Group II. (completing examination).—Elizabeth E. Benson, Margaret P. Posthuma, and Kathleen M. Willmore.

Group I. (completing examination).—Charles F. R. Killick.

EXAMINATION FOR DIPLOMA IN PUBLIC HEALTH.

Part II. (completing examination).—Frederic P. Mackie and Norah A. M. Rodger.

FINAL EXAMINATION FOR DIPLOMA IN DENTAL SURGERY.

Christopher S. Cossham and Sydney Phillips.

UNIVERSITY OF LEEDS.—At the Summer Graduation ceremony on July 4th the following degrees were conferred in the Faculty of Medicine:—

M.D.—Arthur Massey and Harry A. Sinson.

Ch.M.—John T. Blackburn (with distinction).

M.B., Ch.B.—With second-class honours: David R. Allison, Albert Hemingway, Matthew Masser, James L. Moorhouse, James H. O'Donnell, Michael Rabinovich, Rosamond E. Roper, and Geoffrey W. Taylor. Ordinary degree: Maurice Backwell, Leslie V. Broadhead, Isaac Cainer, Francis R. Curtis, John Duncan, John Ewing, Wilfred S. Flowers, Glen Gorstige, John R. S. Greenwood, Philip V. Hardwick, John L. Hartley, Fannie Hirst, James C. Lamont, Sam Leviten, and Edith V. Olver.

UNIVERSITY OF ABERDEEN.—At the Graduation ceremony held on July 9th the honorary degree of Doctor of Laws (LL.D.) was conferred on Dr. John J. R. Macleod, F.R.S., Nobel Prizeman in Medicine, 1923; Professor of Physiology at the University of Toronto. The following degrees were also conferred:—

DOCTOR OF MEDICINE.

•Robert Cruickshank, •John B. Duguid, †Cecil B. Hogg, Arthur A. Hearne (in absentia), and Archibald C. Irvine (in absentia).

• Awarded highest honours for thesis. † Awarded commendation for thesis.

BACHELOR OF MEDICINE AND BACHELOR OF SURGERY.

Douglas Archibald, Horace A. Barker, Catherine H. Baxter, Alexander Brooks, William B. B. Brown, William Bruce, Hew M. N. Calder, Hugh M. Crombie, Alexander Cruickshank, Williamina Cruickshank, Marjorie J. M. Dow, Mary M. Farquhar, William Ferguson, Samuel H. Fine, William Gavin, Henderson Gow, •Walter Graham, •Dorothy M. Harris, Douglas C. Henderson, William F. Ingram, Donald B. C. Lawson, James H. McDonald, John C. MacFarlane, George R. Mackay, John B. Mackay, George N. McLaren, Charles E. Mathieson, Graeme M. M. Menzies, William Menzies, James Murray, Alexander D. Rankin, Archibald C. Reid, Hugh L. Rettie, John M. Ritchie, Grace M. Robinson, Ephraim Sacks, Lyndesay R. D. Smith, •Williamina Stephen, •Gordon Thow, Adam N. S. Watt, Enid M. O. Will, Douglas Wilson, •Edith B. Wilson, and James Wright.

• Completed Final Examination with distinction.

UNIVERSITY OF DUBLIN, SCHOOL OF PHYSIC, TRINITY COLLEGE.—At examinations held recently the following candidates were successful:—

FINAL MEDICAL EXAMINATION.

Part I., Materia Medica and Therapeutics; Jurisprudence and Hygiene; Pathology and Bacteriology.—Edmund P. N. M. Early (passed on high marks), Shirley D. K. Roberts, Menzies L. M'Cauley, Gerald S. Smyth, Robert S. F. Hennessey, Albert Sachs, Robert A. J. Holmes-Ievers, Martinus G. J. Booysen, George S. Gardner, Edward W. Bingham, Arthur N. B. Odbert, John O. Bennett, Norman J. U. Mather, John H. Stephens, Christiaan de W. Meintjes, Daniel A. O'C. Quinlan, Herbert Nelson, Hubert C. Weir, John C. Collins, and John B. Patrick.

Part II., Medicine (M.B.).—James E. M'Cauley, Roy K. Carson, Gladys M. A. Lowry, James W. Wallace, Alexander D. M'Lean, Hope Trant, James J. Cusack, Edward C. Dudgeon, Harry Waters, William H. Coen, Joseph V. Pincus, Kathleen M. Ball, Johan N. S. Gouws, Carol R. J. Boland, Harris Tomkin, George R. L. Jordan, John E. Stokes, Edwin S. A. Crawford, John St. Clair, Philip B. Robinson, Charles L. Taylor, David N. Power, Norah M. Smith, Gerard A. A. Powell, and William O. Warrington.

Surgery (B.Ch.).—Charles F. D. M'Caldin, O'Donel T. D. Browne, Joseph R. Gregory, William C. Somerville-Large, Thomas C. Foster, Robert L. Forsyth, Thomas W. MacDowell, Oliver Chance, James W. Wallace, Ralph A. Webner, William Gallaugher, James Dick, John F. Wilde, William P. E. M'Intyre, Hope Trant, Mary Galvin, Augusta M. Young, Mary C. Livingston, Launcelot W. P. Haskins, Kathleen D. Murison, Agnes L. Kelly, Noel G. M'Auliffe, Norman M. Greeves, Harry Waters, Annie T. Deane, and Gideon J. Joubert.

Midwifery (B.A.O.).—Seymour F. Heatley, Richard G. Keays, Ransome M. Allardyce, and John H. M'Lean (passed on high marks), William B. Roantree, Edward M'Alpine, James W. Bowden, Jack M. Selkon, Nancie N. Lowther, Robert Kahn, William Russell, Stella C. Ross, Jane D. Fulton, Henry J. Roche, William Magowan, Daniel J. Roux, Frances E. O'Connor, Philip F. Palmer, Gladys L. Craig, George A. Walmsley, George R. L. Jordan, Aileen Fair, and Rachel E. Porter.

DIPLOMA IN PUBLIC HEALTH.

Part I., Chemistry, Bacteriology, Physics, and Meteorology.—William F. Shell.

FINAL DENTAL EXAMINATION (B.DENT.SC.).

Dental Surgery and Pathology; Dental Mechanics and Metallurgy; Orthodontics.—Thomas M. Joyce.

Honorary Degrees.—On June 26th the honorary degree of Master in Surgery was conferred on Drs. George W. Crile and Charles H. Mayo, the public orator, Sir Robert Tate, presented the candidates to the University.—The degree of Doctor in Science was conferred on Prof. James P. Hill, F.R.S., and Sir Frederick G. Hopkins.

UNIVERSITY OF LONDON.—In the Faculty of Science the Senate awarded on June 24th the degree of Ph.D. to Annie D. Hoffert, a student of the Lister Institute of Preventive Medicine.

UNIVERSITY OF GLASGOW.—At the graduation ceremony on July 3rd Dr. Archibald J. Cronin received the degree of M.D. with high commendation.

FELLOWSHIP OF MEDICINE AND POST-GRADUATE MEDICAL ASSOCIATION.—There will be a late afternoon course in the diagnosis and treatment of the more common diseases of the nervous system. The course will take place in the out-patient department (73, Welbeck-street) of the West End Hospital, and the lectures and demonstrations will be illustrated by cases. There will be a vacation course at the Prince of Wales's General Hospital (N.E. London Post-Graduate College, Tottenham N.) from August 3rd to 15th. During the two weeks, a ticket for either of which may be taken separately, there will be morning and afternoon sessions from 10.30 A.M. to 5.30 P.M. Each day will include clinical demonstrations, clinics, and clinical lectures, and the whole of the hospital practice will be available for study. The Queen Mary's Hospital, Stratford, will also give an intensive course on similar lines to that at the Prince of Wales's Hospital, from August 24th to Sept. 5th. Special facilities will be given at the latter hospital for the study of gynæcology and obstetrics. Throughout the month a special course will be given at the All Saints' Hospital for Urology. There will be clinical demonstrations daily and a special lecture every Wednesday dealing with the various phases of the disease. Copies of each of the above-mentioned syllabuses, as also the general programme of work, may be obtained from the Secretary, 1, Wimpole-street, W.

ROYAL COLLEGE OF SURGEONS OF ENGLAND.—At a quarterly meeting of the Council of the College, held on July 9th, Sir John Bland-Sutton in the chair, Mr. James Sherren and Sir John Lynn-Thomas, having been duly re-elected and having made the declaration prescribed by the Charter of 1800, took their seats as members of the Council. Mr. Arthur Burgess having been elected and having made the declaration took his seat as member of Council. Mr. Graham S. Simpson having been introduced and made the necessary declaration was admitted a member of the Court of Examiners. Mr. Cecil F. Beadles was appointed Pathological Curator of the Museum for the ensuing year. Mr. R. H. Burne was re-elected Physiological Curator and Sir Frank Colyer was re-elected Curator of the Odontological Collection. Sir John Bland-Sutton was re-elected President of the College. Mr. Walter G. Spencer was re-elected Vice-President, and Mr. James Sherren was elected Vice-President for the ensuing year. The diploma of Fellow was conferred upon Harry Roy Pomroy, Adelaide University and London Hospital, and the diploma of Member upon Edith Grace Peacock, Charing Cross Hospital.

Licences to practise dentistry were conferred upon 57 candidates who have passed the requisite examinations and have complied with the by-laws. The following are the names and schools of the successful candidates:—

F. M. Ackroyd, Guy's; H. S. Alexander and M. N. Anklesaria, Royal Dental; L. Barclay, Guy's; Marjorie K. M. Barnes, Univ. Coll.; W. L. Benson, H. F. Boosey, T. Brimmer, and G. L. N. Burden, Guy's; E. H. Butler, Royal Dental; S. Casper, Guy's; A. H. Chidley, Birmingham; T. O'R. Clancy and E. B. Corry, Guy's; H. A. Creeke, Royal Dental; W. Eddings, Univ. Coll.; C. H. Elphick, Royal Dental; A. C. Evans and G. Evans, Guy's; A. E. Foley and L. Foster, Royal Dental; G. E. Graham, Guy's; Annie H. Halperin, Univ. Coll.; N. Harris, Guy's; Katia Hranova, Royal Dental; O. S. Israilstam, Middlesex; W. R. Jenkins, Guy's; S. M. Jones, London; G. J. T. José and D. Kelvin-Davies, Guy's; C. H. B. Laughton, Royal Dental; Nesta G. Lewis, Univ. Coll.; G. B. Longhurst and A. S. Lowe, Guy's; E. C. Loxton and D. W. MacBean, Royal Dental; A. E. MacLagan, Guy's; J. G. Macvie, Manchester; R. H. Mallett, Durham; C. Malthouse, Manchester; B. S. Mead, Guy's; B. A. Morrisroe, Royal Dental; J. Partridge, Bristol; V. G. Pedley, London; H. R. Peck, Birmingham; J. M. Peet, Liverpool; T. G. Phillips, Royal Dental; H. H. Revill, Guy's; T. I. Richards, Birmingham; M. Simaika, H. E. Slade, E. M. Smith, and R. Thorburn, Royal Dental; D. M. Timpson and C. M. Veysey, Guy's; and H. K. Wallace and A. A. Wilkinson, London.

The undermentioned diplomas were conferred (jointly with the Royal College of Physicians of London):—

Diploma in Psychological Medicine.—G. T. Baker, G. L. Cutts, H. T. Jones, J. J. Laws, J. B. S. Lewis, H. C. McManus, A. H. Pearce, G. F. Peters, R. G. Riches, G. R. A. de M. Rudolf, and J. Russell.

Diploma in Laryngology and Otology.—S. N. Chau, E. D. D. Dickson, R. McM. Glynn, R. E. Jowett, J. P. Kies, N. W. MacKeith, and J. H. Shaw.

THE Dickinson Travelling Research Scholarship in Medicine has been awarded by the trustees of the Manchester Royal Infirmary to Raymond Williamson, M.D. Manch., and Leslie J. Witts, M.B., Ch.B. Manch.

ROYAL MEDICAL BENEVOLENT FUND.—At the last meeting of the committee 24 cases were considered and £386 16*s.* voted to 23 applicants. The following is a summary of the new cases relieved:—

M.D. Edin., 1890, aged 71, practised in S. Africa and held several travelling appointments. Applicant asks for a grant to enable him to get massage. He is bedridden and also has chronic bronchitis. Two brothers meet the nursing home fees of 4 guineas a week, but cannot do any more for him. Voted £5.

Daughter, aged 48, of L.R.C.P. Edin. who practised in Wales and died in 1924. Applicant is not mentally able to support herself, and her only income from investments amounts to £48 per annum. A brother in Canada gave £20. Rent is £31 per annum. Voted £15 in 12 monthly instalments.

Daughter, aged 58, of M.R.C.S., 1843, who practised in Warwickshire and died in 1877. Applicant lost most of her money by lending large sums to so-called friends who did not repay. She is now left with capital which brings in 15*s.* a week, but she has had to draw upon this capital at the rate of 32*s.* 6*d.* a week to meet expenses. She lives with an adopted sister. A cousin gave the applicant £6 last year. Rent and rates amount to £24 per annum. Voted £18 in 12 instalments and referred to our Guild for clothing.

Subscriptions may be sent to the honorary treasurer, Sir Charters Symonds, at 11, Chandos-street, Cavendish-square, W. 1.

MENTAL HOSPITALS ASSOCIATION.—The seventh annual meeting of this Association was held on July 8th, when the report of the Executive Committee was received. The committee gave evidence before the Royal Commission on Lunacy Reform, and continues to take every opportunity of urging on the Government the necessity for so altering the existing system as to bring it into line with modern ideas on treatment of mental disorder. Representatives have met members of the National Asylum Workers Union to discuss hours of duty and rates of pay, and recommendations were agreed to with a view to removing certain anomalies. There have also been conferences with the Medico-Psychological Association, the Association of Clerks and Stewards of Mental Hospitals, and the National Union to discuss proposed amendments of the Asylum Officers Superannuation Act, 1909. The committee was unable to advise support of the draft Bill until more definite actuarial investigations had been made. The meeting then discussed the question of adopting a flat rate of sick-pay in all districts for prolonged periods of illness. A motion instructing the Executive Committee to take steps to secure the flat rate was carried. It was also proposed that steps be taken to secure a larger contribution from Imperial funds for local maintenance of mental cases.

ROYAL SOCIETY OF MEDICINE: ELECTION OF OFFICERS.—At the annual general meeting, held on July 1st, the following officers were elected for the session 1925–26:—

President: Sir StClair Thomson. Past President: Sir William Hale-White. Hon. Treasurers: C. H. Fagge, M.S., and E. Farquhar Buzzard, M.D. Hon. Librarians: Walter G. Spencer, M.S., and W. Bulloch, M.D., F.R.S. Hon. Secretaries: W. Girling Ball, F.R.C.S., and H. Letheby Tidy, M.D. Other Members of Council: Sir James Berry, F.R.C.S.; Sir George Blacker, M.D.; Sir Charlton Briscoe, M.D.; Sir George Buchanan, M.D.; H. W. Carson, F.R.C.S.; Maurice A. Cassidy, M.D.; V. Zachary Cope, M.S.; T. Watts Eden, M.D.; R. C. Elmslie, M.S.; A. M. H. Gray, M.D.; Robert Hutchison, M.D.; Cyril A. R. Nitch, M.S.; Herbert J. Paterson, M.C.; Herbert Tilley, F.R.C.S.; G. de Bec Turtle, M.D.; A. E. Webb-Johnson, F.R.C.S.; and E. F. White, F.R.C.S.

The Presidents of the Sections are ex-officio Vice-Presidents of the Society and Members of the Council. The following have been elected:—

Anæsthetics: F. E. Shipway, M.D. Balneology and Climatology: R. Llewellyn Jones Llewellyn, M.B. Study of Disease in Children: Philip Turner, M.S. Clinical: G. Newton Pitt, M.D. Comparative Medicine: Frederick T. G. Hobday, F.R.C.V.S. Dermatology: J. H. Sequeira, M.D. Electro-Therapeutics: Alastair MacGregor, M.D. Epidemiology and State Medicine: J. C. McVail, M.D. History of Medicine: J. D. Rolleston, M.D. Laryngology: W. H. Kelson, M.D. Medicine: Hugh Thursfield, M.D. Neurology: H. Campbell Thomson, M.D. Obstetrics and Gynæcology: T. G. Stevens, F.R.C.S. Odontology: J. Lewin Payne. Ophthalmology: Sir Arnold Lawson, F.R.C.S. Orthopædics: A. S. Blundell Bankart, M.Ch. Otology: G. J. Jenkins, F.R.C.S. Pathology: J. A. Murray, M.D., F.R.S. Psychiatry: R. H. Cole, M.D. Surgery: Sir Lenthal Cheatle, F.R.C.S. Therapeutics and Pharmacology: George Graham, M.D. Tropical Diseases and Parasitology: Sir William Prout, M.B. Urology: R. H. Jocelyn Swan, M.S. War: Sir William Leishman, M.B., F.R.S.

The new Council takes up office on Oct. 1st.

A GUY'S HOSPITAL "RECORD."—Last year Guy's dealt with 10,017 in-patients—the largest number ever recorded. Their average stay was 21¼ days. There were 124,000 out-patients, of whom only 179 were unable to pay for their medicines.

HOSPITAL NEEDS OF SOUTH WALES.—At a recent meeting of the Cardiff Medical Society it was stated that although the population of the Cardiff end of Glamorganshire numbers 800,000, only 850 hospital beds are available. On the basis of 2 beds per 1000 people, 1600 beds are needed.

THE PLYMOUTH HOSPITALS.—The exhibition opened at Plymouth by Prince Henry, reinforced by a fête and fair, on behalf of the Plymouth hospitals, has been successful beyond expectation. It was hoped to raise £10,000; more than £20,000 was actually obtained.

AN INSTITUTE OF OTOLOGY.—The Right Hon. T. R. Ferens, of Hull, has given £20,000 to the Medical School of Middlesex Hospital for the foundation of an Institute of Otology. It is intended to establish a laboratory, museum, and library entirely devoted to research in diseases of the ear, nose, and throat, and it is hoped that it may eventually be possible to create studentships.

A MINERS' REST HOME.—At Rudyard Lake, about 12 miles from Stoke-on-Trent, a rest home for the miners of North Staffordshire was opened on July 4th. The site for the home, the building, and its equipment cost £61,000, raised by the 1*d.* a ton levy for the Miners' Welfare Fund. It contains 42 beds for miners recovering from accident or illness, with billiard and other recreation rooms, and facilities are provided for outdoor amusements and exercise.

NEW SANATORIUM FOR OLDHAM.—At a cost of £10,000 the Oldham Health Committee have built a new sanatorium at Strinesdale, to replace the wooden hospital erected about 30 years ago. Situated on an eminence adjoining the Yorkshire moors, about 1050 feet above sea-level, the new building is so constructed as to get the sunlight and to protect the patients as much as possible from the wind. The building provides accommodation on two floors for 48 patients, 24 in the three end wards, and the remainder in separate cubicles. The official opening took place on June 29th.

CARTER HOSPITAL, MIDDLESBROUGH. — Nearly 20 years ago the late Alderman Carter, of Middlesbrough, bequeathed £40,000 for the provision of a hospital. This sum has accumulated to about £100,000, and the Alderman Carter Bequest Hospital is now approaching completion. By restricting the number of beds to 52 a complete endowment will be provided. Eight of the beds are for patients whose payments will just clear the cost of maintenance. The hospital, which covers four acres, is divided into three two-storey blocks and is being supplied with the most modern equipment and appliances.

SOCIETY OF M.O.H.'S: COMPLIMENTARY DINNER TO SIR JOHN ROBERTSON.—A complimentary dinner to Sir John and Lady Robertson was given by the Midland branch of the Society of Medical Officers of Health at the Queen's Hotel, Birmingham, on July 10th. The President of the branch, Dr. R. Woolsey Stocks, was in the chair. Dr. G. F. Buchan, in proposing the toast of the evening, referred to Dr. Robertson's passion for research in every branch of public health which had been the mainspring of his life, and had rendered his judgment sound on housing and the food-supply, and in the foundation of the first municipal sanatorium at Cheltenham. In cancer research his work had been silent and steadfast. His willingness to befriend all with whom he came in contact was reaffirmed by Miss Bartlett, chairman of the Birmingham Health Committee. Sir John Robertson, in reply, described the honour as a recognition of the merit of the public health service. Public health work was, he said, happy work, though results were not accomplished rapidly. Reduction of mortality in towns to nearly one-half, and infant mortality to less than half, was no doubt due to a number of causes, but medical officers of health had at all events set the pace by educational effort. The war had put back the clock 30 years for public health, but the town-planning legislation recently passed was of first-rate importance. A country breeding, and a taste for agriculture and geology he had found of great value in his work at St. Helens, Sheffield, and for 22 years at Birmingham. Mr. Furneaux Jordan proposed, and Dr. R. A. Lyster responded, to the toast of the Society of M.O.H.'s. A well-chosen musical programme added to the festivity of the evening.

THE CENSUS REPORT.—The final volume presenting tabulated statistics derived from the 1921 Census of England and Wales is now published (H.M. Stationery Office. 13*s.*). It contains 200 folio pages of closely printed figures, and presents for the country as a whole, and for certain subdivisions of it also, statistics of the same nature as those published in the earlier volumes for each country. It also includes certain hitherto unpublished figures dealing with populations of county court circuits and districts, seamen and fishermen not enumerated on Census night, and persons under service discipline outside Great Britain.

GUY'S HOSPITAL MEDICAL SCHOOL.—The following scholarships have been awarded: Entrance Scholarship in Arts, £100, Herbert Aidan Constable, Wimbledon College; Entrance Scholarship in Science, £100, divided between Walter Horace Allen, Guy's Hospital Medical School, and Frederick Harwood Stevenson, St. Paul's School; Confined Scholarship in Science, £100, William John Ferguson, Crampton County School and Guy's Hospital Medical School. Guy's Hospital Dental School: War Memorial Scholarship in Arts, £40 for four years, Joseph Cuthbert McNeill, Wadham College, Oxford; Entrance Scholarship in Science, £40 for four years, Geoffrey Blake Palmer, Emanuel School.

MEDICAL TOUR TO THE SPAS OF ITALY.—A second study tour for medical men to the spas and climatic health resorts of Italy, organised by the Italian State Tourist Department, will leave Milan on Sept. 5th, visiting among other places, San Pellegrino, Fonte Bracca, Acqui, Leghorn, Montecatini, Monsummano, Chianciano, Fiuggi, Alassio, and Viareggio, the tour ending at Rome on Sept. 21st. The journey is under the guidance of Prof. Guido Ruata, M.D., and medical men speaking English, French, Italian, and German will act as interpreters. The party is limited to 200 and the charge for the complete tour is 1600 lire. This includes first-class accommodation. There are still a few vacancies. Further particulars can be obtained from the Italian State Railways Tourist Office, 12, Waterloo-place, Regent-street, S.W. 1.

DONATIONS AND BEQUESTS.—Mrs. Emily Louisa Acret, Rosslyn Hill, Hampstead, bequeathed £2000 to Mabel Acret, of Ontario, lately a nursing sister of Queen Alexandra's Nursing Sisters Reserve "in recognition of her services to the Old Country in the Great War," and £2000 to the Hampstead General Hospital for the endowment of an "Acret Bed"; £200 to the Soldiers' Daughters' Home, N.W.; £100 to the Royal Sailors' Daughters' Home, N.W.; and her freehold property at Belvedere, Kent, to the Blind School, Swiss Cottage, for an "Acret" annuity.—A gift of £1000 has been made by the Mercers' Company to the Fulham, Chelsea, and Kensington General Hospital for building funds. —Mr. George Henderson, an East India merchant, of Palace Court, W., left £1000 to the London Hospital.—Mr. John Alexander Kennedy, draper, of Sunderland, left £500 each to the Sunderland Royal Infirmary, the Children's Hospital associated with the Royal Infirmary, £100 each to the Heatherdene Home, Harrogate, the Sunderland Orphan Asylum, the Northern Counties Orphan Institution for Boys, Newcastle-upon-Tyne, and £50 to the Royal Institution for the Blind, Newcastle. On the decease of his wife he left £1000 each to the Sutherland Royal Infirmary for a Jean Ross Kennedy bed and to the Children's Hospital in connexion with the Royal Infirmary for a similar bed.—The late Mrs. Harriett Sturges, of Birmingham, who left property of the value of over £30,000, bequeathed the residue after certain small bequests equally between the Birmingham General Hospital; the Queen's Hospital, Birmingham; the Birmingham Children's Hospital; the Birmingham and Midland Hospital for Women; the Birmingham Deaf and Dumb Institution; the Royal Institution for the Blind, Birmingham; and Dr. Barnardo's Homes.—The late Mr. James Taylor, M.R.C.S., of Alma-road, Clifton, Bristol, who left estate of the gross value of £22,002, among other bequests gave to Bristol University for the Medical Library all his medical books; £1000 to Epsom College for the endowment of a scholarship in memory of the Rev. W. A. Thomas, to be known as the "Thomas Scholarship"; £1000 in trust for Elizabeth Arabella Taylor for life and then to the Bristol Royal Infirmary.

THE LANCET: SUBSCRIPTION RATES.

INLAND	One Year	£2	2	0
	Six Months	1	1	0
	Three Months	0	10	6
ABROAD	One Year	2	10	0
	Six Months	1	5	0
	Three Months	0	12	6

Medical Diary.

Information to be included in this column should reach us in proper form on Tuesday, and cannot appear if it reaches us later than the first post on Wednesday morning.

SOCIETIES.

ROYAL SOCIETY OF MEDICINE, 1, Wimpole-street, W.

Tuesday, July 21st.

GENERAL MEETING OF FELLOWS: at 5.30 P.M.
Ballot for election to the Fellowship.

BIOCHEMICAL SOCIETY.

SATURDAY, July 18th.—5 P.M., Joint Meeting with the Agricultural Education Association at University College, Reading).

Communications: R. H. A. Plimmer: The Action of Nitrous Acid upon Amides and some Amino Compounds. W. J. N. Burch: Some Esters of Phosphoric Acid. — Mattick and — Wright: The Influence of Administration of Certain Salts on the Inorganic Constituents of Milk. E. Ponder and W. W. Taylor: The Conductivity of Cell-suspensions. G. D. Thacker and J. R. Marrack: The State of Calcium in Body Fluids.

LECTURES, ADDRESSES, DEMONSTRATIONS, &c.

WEST LONDON POST-GRADUATE COLLEGE, West London Hospital, Hammersmith, W.

MONDAY, July 20th.—12 noon, Mr. Simmonds: Applied Anatomy. 2 P.M., Mr. Donald Armour: Operations. 2 P.M., Mr. Bishop Harman: Eye Dept.

TUESDAY.—10 A.M., Medical Registrar: Clinical Methods. 12 noon, Dr. Burrell: Chest Cases. 2 P.M., Mr. Addison: Operations.

WEDNESDAY.—2 P.M., Dr. Burnford: Medical Wards. 2 P.M., Dr. Owen: Medical Out-patients. 2 P.M., Mr. Tyrrell Gray: Operations.

THURSDAY.—10 A.M., Dr. Grainger Stewart: Neurological Dept. 12 noon, Surgical Registrar: Surgical Pathology. 2 P.M., Mr. MacDonald: Genito-Urinary Dept.

FRIDAY.—10.30 A.M., Dr. Dowling: Skin Dept. 11 A.M., Dr. McDougal: Electrical Dept. 2 P.M., Mr. Sinclair: Surgical Out-patients.

SATURDAY.—10 A.M., Dr. Saunders: Medical Diseases of Children. 10 A.M., Mr. Banks-Davis: Operations of the Throat, Nose, and Ear.

Daily, 10 A.M. to 6 P.M., Saturdays, 10 A.M. to 1 P.M., In-patients, Out-patients. Operations, Special Departments.

HOSPITAL FOR SICK CHILDREN, Great Ormond-street, W.C.
THURSDAY, July 23rd.—4 P.M., Dr. Nabarro: The Cerebro-Spinal Fluid in Health and Disease.

Appointments.

Royal Northern Hospital, Holloway: CALVERT, EDWIN G. B., M.D., M.R.C.P., Physician with charge of Out-patients; LANE-ROBERTS, C. S., F.R.C.S., Obstetric Surgeon with charge of Out-patients.

University of Manchester: STEWART, D., M.R.C.S., L.R.C.P. Lond., Lecturer in Anatomy; PATERSON, R. S., M.B., Ch.B. Manch., Lecturer in Applied Anatomy; OLIVER T. H., M.D. Manch., Lecturer in Systematic Medicine; MELLAND, C. H., M.D. Lond., B.Sc. Manch., Lecturer in Medicine for Dental Students; KELLY, A. C., M.B., Ch.B. Manch., Demonstrator in Anatomy.

Vacancies.

For further information refer to the advertisement columns.

Aylesbury, Royal Buckinghamshire Hospital.—Res. M.O. £150.
Barbados General Hospital.—Sen. Res. Surg. £330. Jun. Res. Surg. £300.
Bath, Royal Mineral Water Hospital.—Res. M.O. £130.
Birkenhead Union Infirmary.—Res. Asst. M.O. £300.
Birmingham Cripples' Union and Royal Orthopædic and Spinal Hospital.—Jun. H.S. £150.
Birmingham, Queen's Hospital.—Asst. Obstet. O. £50.
Birmingham University.—Lecturer in Physiological Dept. £300. Demonstrator of Anatomy. £300. Also Waller Myers Travelling Studentship. £300.
Cairo, School of Dental Surgery.—Supt. and Lecturer in Metallurgy, &c. £E.900. Lecturer in Surg. £E.480. Asst. Lecturer in Surgery. £E.360. Lecturer in Mechanics. £E.480.
Cardiff City Mental Hospital, Whitchurch.—Res. Clin. Asst. 50 guineas.
Cumberland and Westmorland Mental Hospital, Jun. Asst. M.O. £350. Tubere. O.
Deptford Metropolitan Borough.—Asst. M.O.H. and £750.
Durham County Mental Hospital.—Asst. M.O. £40.
Eastbourne, Royal Eye Hospital.—Hon. Ophth. S.
East London, South Africa Frere Hospital.—Res. M.O. £300.
Evelina Hospital for Children, Southwark, S.E.—H.S. £120.
Gloucestershire Royal Infirmary, &c., Gloucester.—Asst. H.S. £150.
Grosvenor Hospital for Women, Vincent-square.—Anæsth.
Hampstead General and N.W. London Hospital, Haverstock-hill, N.W.—Radiologist. £100.
Hertford County Hospital.—H.S. £150.
Hong Kong University.—Reader in Biology. £600.
Liverpool University.—Professor of Entomology. £800.
Manchester, Ancoats Hospital.—Asst. H.P. £100. Also Anæsth. 10s. 6d. per attendance.
Margate, Royal Sea Bathing Hospital.—H.S. £200.
Northampton General Hospital.—Hon. Asst. S.
Pietermaritzburg, Grey's Hospital.—Male H.S. £500.
Queen's Hospital for Children.—Asst. Cas. M.O. £100.
St. Mark's Hospital for Cancer, &c., City-road, E.C.—Hon. S. Also Hon. Asst. S.
St. Mary's Hospital for Women and Children, Plaistow.—Clin. Asst.
St. Marylebone General Dispensary.—Gynæcologist.
St. Paul's Hospital for Skin, &c., Diseases.—Hon. Anæsth.
Samaritan Free Hospital for Women.—H.S. £100.
Southampton, Royal South Hants Hospital.—Jun. H.S. £150.
Whittingham, Preston, County Mental Hospital.—Temp. M.O. £7 per week.
Willesden General Hospital.—Hon. Anæsth.

The Chief Inspector of Factories, Home Office, London, S.W., announces the following vacant appointments for Certifying Factory Surgeons: Snaith, Yorks; and Hoddesdon, Hertford.

The Secretary of State for the Home Department gives notice of a vacancy for a Medical Referee under the Workmen's Compensation Act for the Districts of the Camelford, Holsworthy, and Launceston, &c., County Courts. Applications should reach the Private Secretary, Home Office, not later than August 5th.

Births, Marriages, and Deaths.

BIRTHS.

BATTERHAM.—On July 5th, at the Military Families Hospital, Cologne, the wife of Captain D. J. Batterham, R.A.M.C., of a son.

CLOUSTON.—On July 6th, at Lavenham, Suffolk, Olive Gwendoken Clouston, M.R.C.S., L.R.C.P., wife of Eric C. T. Clouston, M.R.C.S., L.R.C.P., of a son.

KERRIGAN.—On July 2nd, at Devonport, the wife of Surgeon-Lieut.-Commander O. J. M. Kerrigan, R.N., H.M. Dockyard, of a son and daughter.

RIVETT.—On July 12th, at a nursing home, to Mary, wife of Louis Carnac Rivett, of 118, Harley-street and 3, Hanover-terrace—a daughter.

SOUPER.—On July 11th, at Victoria-street, Aberdeen, the wife of Dr. H. Ross Souper, of a daughter.

MARRIAGES.

CLAXTON—ERVINE.—On June 30th, at Saint Saviour's Church, Denmark Hill, Dr. E. Claxton, of Bath, to Muriel Ervine, of Denmark Hill.

COLWILL—WORRINGHAM.—On July 11th, at St. Mary Abbot's, Kensington, W., Charles Kingsley Colwill, M.R.C.S., L.R.C.P., to Muriel, daughter of Mr. and Mrs. Charles Worringham, of Inverna-gardens, Kensington, W.

DEATHS.

CAMPBELL.—On July 3rd, at a nursing home, after an operation, George Maclean Campbell, M.C., M.B. Lond., M.R.C.S. Eng., L.R.C.P. Lond., late Captain, R.A.M.C., aged 37.

CLIFFORD.—On July 8th, at his residence, 15, St. John-street, Manchester, Harold Clifford, M.B., F.R.C.S. Edin., Hon. Gynæcological Surgeon to St. Mary's Hospitals, Manchester, and the Salford Royal Hospital.

GUBBINS.—On July 8th, at Westgate, from the effects of a cycling accident, Lieut.-General Sir Launcelotte Gubbins, K.C.B., M.V.O., J.P., late Director-General A.M.S., in his 76th year.

REW.—On July 6th, died suddenly, G. R. Rew, M.R.C.S., L.R.C.P., of Bedfont, Feltham, late of King's College, London.

STEWART.—On June 26th, at Stonebridge Park, William James Johnstone Stewart, M.D. Edin., D.P.H. Camb., for 22 years Medical Superintendent of the Willesden Municipal Hospital, aged 57.

WICKHAM.—On June 30th, at Lenworth, Southbourne-on-Sea, Hants, Charles A. Wickham, M.R.C.S., L.R.C.P., late of Willesborough, Ashford, Kent.

N.B.—A fee of 7s. 6d. is charged for the insertion of Notices of Births, Marriages, and Deaths.

Notes, Comments, and Abstracts.

COLONIAL HEALTH REPORTS.

CAYMAN ISLANDS (DEPENDENCY OF JAMAICA).

Mr. H. H. Hutchings (Commissioner) has forwarded to the Colonial Office a report for 1923 on these three small islands in the Caribbean Sea, lying north-west of Jamaica, and approximately mid-way between that island and the south-west coast of Cuba. He states that the general health of the Dependency is good. Digestive disorders of a mild nature are prevalent, induced by the sameness of a diet of starchy foods. There is an occasional case of typhoid. Care with respect to arrivals from Jamaica have prevented the introduction of alastrim. There were 179 births in 1923 (34 per 1000) and 55 deaths (10 per 1000). The population is estimated at approximately 5253. The rainfall amounted to 54·76 inches in the Georgetown or western district of the Grand Cayman. The air temperature ranges between 70° and 80° F. in the cooler winter months, and 10° higher in summer. The nightly calms and the excessive dampness accentuate the heat of summer.

LEEWARD ISLANDS.

In the report for 1923-24 the following particulars are given respecting the five Presidencies constituting the Federation or Colony. In Antigua the estimated population on Dec. 31st, 1923, was 29,420. The births during the year were equal to a birth-rate of 38·68 per 1000, of which 78·03 were illegitimate. The death-rate was 27·56 per 1000. In the Presidency of St. Kitts-Nevis, the birth-rate was 41·7 per 1000 in St. Kitts, 30·8 in Nevis, and 28·6 in Anguilla. In Dominica the population was estimated at 38,632, the birth-rate 37·22 per 1000, and the death-rate 26·66. Illegitimate births exceeded the legitimate by 292. Montserrat had a population of 11,890. The legitimate births were 110 and the illegitimate 315, the percentages being 25·8 and 74·1 respectively. The death-rate was 15·5 per 1000. The general health of the colony during the year was satisfactory. No epidemic disease occurred. The appearance of small-pox in Antigua led to the introduction, for a period of five months, of compulsory revaccination in St. Kitts-Nevis. The campaign met with ready acceptance on the part of the public. The revaccinations performed, added to the number of those persons immunised by recent revaccination or primary vaccination, may be regarded as having effected for the present the satisfactory protection of the whole Presidency. The vigilance and precautions of the Quarantine Board and Harbour Authorities, however, have been in no way relaxed. The campaign against yaws and syphilis, which had been in abeyance for a time, was recommenced on improved lines in November, 1923. The moogrol treatment of the inmates of the Leper Asylum was continued and extended during the year with gratifying results. The epidemic of alastrim, which had been present in the island since July, 1922, and which had done considerable harm to trade owing to the quarantine restrictions imposed by other places, came to an end in September, 1923. No further cases have occurred.

MAURITIUS.

The report for 1923 is signed by Mr. H. Lalonette, Acting Assistant Colonial Secretary. The section relating to vital statistics and public health states that the estimated population on Dec. 31st was 381,678, an increase of 5193 on the last census figures. The birth-rate in the general population was 40·9 and in the Indian population 34·9 per mille, whilst the death-rates per 1000 in the two populations were 29·6 and 28·1. The mortality was remarkably low, the death-rate being the lowest since 1891. The number of deaths due to malaria and malaria cachexia (the highest death-producing factors in Mauritius) was 1979, as against 3526 the year before. The next high causes of death were pneumonia and broncho-pneumonia (1393) and diseases of early infancy (1026). There were 139 cases of plague during the year, of which 118 were fatal; the largest number of cases was, as usual, in Port Louis (117). There were 150 cases of enteric fever, as against 224 in the previous year. The infantile mortality (deaths of children under one year) gave a ratio of 139·4 per 1000 live births, as against 147·9 in 1922. There were 1557 still-births registered during the year, corresponding to a rate of 112·2 per 1000 live births. The number of cases treated in the public hospitals and at the dispensaries was 82,326, this total being much below that for 1922 and for the five-year period 1919-23. The total number of persons certified insane on Dec. 31st was 708, or 34 less than the year before. Admissions to the lunatic asylum numbered 194. At the Leper Asylum there were 37 patients (males 25, females 12) at the beginning of the year. Admissions during the year numbered 16, deaths 2, and discharges 14. The construction of the new leper asylum has been completed, and the transfer of the lepers effected. The law relative to compulsory segregation of lepers will be brought into operation at an early date. The climate is tropical, but, owing to the high elevation of the central plateau, a large part of the island enjoys a temperate and even bracing climate. The average temperature of this highland region is about 60° F., and the maximum about 80°. The low-lying coastal region has naturally a higher average temperature ranging from 90° to 70°. Mauritius lies in the track of cyclones, which are liable to occur during the months of December to April. There has been no very severe cyclone since 1892. The rainfall is irregular, and varies according to the locality and elevation. In the central portion of the island an average yearly rainfall of 175 inches is recorded. That of the coastal districts varies between 25 and 30 inches.

SEYCHELLES.

Brigadier-General Sir Joseph A. Byrne, K.B.E., C.B., the Governor of this colony, in his report for 1923, states that the population is estimated at 25,700, being an increase of 1177 since the Census of 1921. The births in 1923 numbered 771, corresponding to a rate of 30·62 per 1000. The deaths were 297, or 11·79 per 1000. This low death-rate constitutes a record, and is partly due to the fact that no epidemics of an infectious or contagious disease occurred during the year. Although almost on the equator, the climate of Seychelles is quite healthy, and owing to the absence of the anopheline mosquito malaria does not occur. The maximum shade temperature rarely exceeds 86° F., but even at night the temperature seldom falls below 74°. The hottest weather occurs during the months of March and April. The rainfall averages about 90 inches, although in some years it has reached 115 inches. The estimated total number of square miles comprised in the Seychelles Islands and their dependencies is 156¼.

TONGAN ISLANDS PROTECTORATE.

Mr. J. McOwan, the British Agent and Consul at Tonga, writes in a report for 1923-24 that the estimated population on Dec. 31st was 24,673. The birth-rate for the year was 33·21 per 1000, and the death-rate 22·68. The population includes 571 Europeans and 235 half-castes. The islands are situated 390 miles to the E.S.E. of Fiji, and have an area of 385 square miles. Queen Salote Tubou, the present queen, succeeded to the throne on the death of her father, King George Tubou II., in 1918. A Protectorate was proclaimed over the kingdom of Tonga in 1900, under which Great Britain assumed the exercise of civil and criminal jurisdiction over all subjects and foreign powers in Tonga, and an agent and consul was appointed to advise the Queen and Government, and to supervise the financial administration. The seat of government is at Nukualofa, on the island of Tongatabu. Although the Tongan group lies between latitudes 16 and 22 degrees south, and is therefore within the tropics, the climate is probably the best of any of the islands in the Western Pacific. For eight months of the year (May to November inclusive) the thermometer rarely registers higher than 83° F., and as the humidity is comparatively low during these months, Europeans do not feel the heat to the same extent as in the groups to the north. During the wet season (December to March inclusive) the temperature ranges from 65° to 94°, with a higher humidity. Malaria and tropical fevers are unknown.

THE WHISPER AS A MEASURE OF DEAFNESS.

A WHISPER, uttered at the end of expiration, is more likely than the normal voice to have a similar loudness from day to day, and that is why a whisper is used for the assessment of deafness in the French Army, no recruit who cannot hear a whisper at 18 inches being accepted for the ranks, though he may be accepted for the auxiliary services if he can hear it at anything over 9 inches. Méd. Maj. P. E. H. F. Bertein, from whose paper on "The Measurement of Deafness," in the *Archives de Médecine Militaires* for April we quote, adds that the figures 1, 3, 9 are more easily heard by men with nerve deafness; 5, 6, 8 by those with middle-ear disease. Before men are sent to the ear specialist, with whom in every doubtful case lies the ultimate decision, each should have his deafness estimated quantitatively, and more than once, by his regimental officer, to allow the honesty of the patient to be appreciated, and also possible variations in his deafness.